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KENTUCKY TRANSPORTATION CENTER

College of Engineering

INTELLIGENT TRANSPORTATION SYSTEMS STRATEGIC PLAN
(Final Report)

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Research Report
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INTELLIGENT TRANSPORTATION SYSTEMS STRATEGIC PLAN
(Final Report)

by

Kentucky Transportation Center
College of Engineering
University of Kentucky
Lexington, Kentucky

in cooperation with

Kentucky Transportation Cabinet
Commonwealth of Kentucky

and

Federal Highway Administration
U.S. Department of Transportation

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16. Abstract

This report presents a strategic plan for Intelligent Transportation Systems (ITS) in Kentucky. The purpose of this Strategic Plan is to offer a vision for ITS in Kentucky and to identify key goals for each functional area of ITS. A mission, vision, and goals are presented for Advanced Rural Transportation Systems, Advanced Traveler Information Systems, Commercial Vehicle Operations, Advanced Traffic Management Systems, Advanced Public Transportation Systems, and Advanced Vehicle Safety Systems. Also included is an inventory of existing ITS projects in Kentucky. Some of the fundamental elements of achieving the ITS vision are presented and discussed, including public relations and marketing, operations and maintenance, and organizational structure.

This plan serves as the foundation for development of a Statewide ITS Architecture and an ITS Business Plan.

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INTELLIGENT TRANSPORTATION SYSTEMS STRATEGIC PLAN
(Final Report)

EXECUTIVE SUMMARY

This report presents a Strategic Plan for Intelligent Transportation Systems (ITS) in Kentucky. The purpose of this Strategic Plan is to offer a vision for ITS in Kentucky and to identify key goals for each functional area of ITS. Some of the fundamental elements of achieving the ITS vision are presented and discussed, including public relations and marketing, operations and maintenance, and organizational structure. This plan serves as the foundation for development of a Statewide ITS Architecture and an ITS Business Plan, both of which are currently in progress.

To place Kentucky's Strategic Plan in its proper context, this report presents information on the national ITS program, including some history and a description of ITS functional areas and user services. An overview of the National ITS Architecture is provided, including a summary of the architecture development process, a brief description of the architecture documentation, and a discussion of the value of an ITS architecture.

An inventory of existing ITS projects in Kentucky was conducted, and the resulting project summaries are included in Section 4.0 of the report. Also included in Section 4.0 is a map of Kentucky showing the project locations.

Kentucky's ITS Strategic Plan development began in early 1997. The Plan was developed in two phases. The first phase focused on the areas of Advanced Traveler Information Systems (ATIS), Advanced Rural Transportation Systems (ARTS), and Commercial Vehicle Operations (CVO). The remaining areas of Advanced Traffic Management Systems (ATMS), Advanced Public Transportation Systems (APTS), and Advanced Vehicle Safety Systems (AVSS) were included in the second phase of the project. The first phase results were published in an interim report in May 1998.[1] The final report, completed in June 2000, includes the results of both phases of the project and is designed to be a stand-alone document.

A survey of other states was conducted to determine the status of ITS strategic plan development nationwide. The eleven states that had completed strategic plans provided valuable information for guiding the development of Kentucky's plan and for identifying the essential elements of a strategic plan.

A focus group meeting was held in Frankfort, Kentucky, in October 1997, to assist in the development of a mission, vision, and goals for ATIS and ARTS. A second focus group session was held in December 1997, involving state and local transportation planners. Results from both meetings provided essential input for developing the Strategic Plan components for ATIS and ARTS.

Kentucky has had a well-developed CVO program in place for several years and is recognized as a national leader in this area. Thus, Kentucky initiated strategic planning efforts related to CVO long before the ITS Strategic Plan project began. The strategic plan for

Commercial Vehicle Operations developed out of the convergence of several parallel processes in Kentucky, including the "Empower Kentucky" initiative (a statewide effort to redesign government processes), the CVO working group (first convened in the summer 1996), and the national Commercial Vehicle Information Systems and Networks (CVISN) program. In an effort to conceptually organize the various CVO activities in Kentucky, an inclusive visioning exercise was held in early 1997. Out of this exercise emerged the six critical vision elements that guided the CVO strategic plan.

For the second phase of the project, another ITS focus group session was held in November 1999, focusing on ATMS, APTS, and AVSS. The morning session included several presentations on ITS, followed by afternoon breakout sessions. The results from the focus groups were used by Kentucky Transportation Center staff to prepare a mission statement, vision statement, and list of goals for each area.

Section 6.0 of the final report contains descriptions of the mission, vision, and goals for all six functional areas of ITS.

Successful implementation of ITS technologies will require significant emphasis on public relations and marketing. ITS is a new concept to many, and acceptance of new concepts is not automatic. Thus, it is essential to provide accurate and useful information to transportation decision-makers, providers, and users throughout the state. The value of ITS in enhancing the safety, efficiency, and convenience of transportation must be actively promoted. Many different strategies and techniques exist for marketing ITS. Kentucky is fortunate to have several early "success stories," which provide excellent opportunities to promote the virtues of ITS.

State and national ITS programs have traditionally emphasized the goal of developing and deploying systems. In most cases, little emphasis has been given to the operation and maintenance (O&M) of those systems. ITS technologies present many significant O&M challenges to traditional transportation agencies. Thus, it is essential that all new ITS projects include full consideration of O&M from the earliest stages of planning. It is further recommended that the Transportation Cabinet develop an ITS Maintenance Plan.

A final consideration in implementing ITS is the organizational structure and the roles and responsibilities of various ITS-related entities in the Commonwealth. Determining the best organizational structure requires an understanding of administrative context, ITS mission, and the commitment level of those in positions of leadership. ITS development and deployment requires specialized knowledge and skills, and it is beneficial to bring those diverse skills close together within the organization. Thus, it makes sense, in our current environment, to create a special development/deployment staff to focus on ITS. However, it should be recognized that ITS technologies, while currently viewed as unique, will become standard practices in the 21st century.

[1] Intelligent Transportation Systems Strategic Plan (Phase 1 Report); Kentucky Transportation Center, College of Engineering, University of Kentucky; Research Report KTC-98-9; Lexington, KY; May 1998.

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1.0 INTRODUCTION

As a result of rapidly developing electronic technologies and control systems, Intelligent Transportation Systems (ITS) offer promise as alternatives for enhancing Kentucky's and the nation's future mobility. These systems are expected to play a significant role in the post-Interstate highway program, supplementing road construction, transit expansion, and other more traditional means for safely and efficiently accommodating increasing travel demands. At the same time, prospects for truly interactive, real-time communication with nearby vehicles, roadway sensors, and control systems add a whole new dimension to the task of providing and managing the highway infrastructure. No longer will it suffice to simply ensure that the infrastructure is physically compatible with the vehicles that use it--that the lanes are wide enough, the pavement is strong enough, the curves are banked enough, or the grades are flat enough. Instead, with ITS, drivers, vehicles, and the roadway will be electronically linked by sophisticated systems for sensing, communication, computation, and control. Transmitted information will be precise and timely, indicating actual roadway conditions. Driver displays and other cues will optimize driver performance while minimizing human error. On-board instrumentation will be carefully integrated with roadside electronics. Control systems will be dynamic, continually responding to the interaction of vehicles and the roadway. In short, the driver/vehicle/roadway system will be genuinely integrated as never before.

To realize these ends will require unprecedented coordination between vehicle manufacturers, technology suppliers, and transportation providers. Jurisdictions will need to work closely together to avoid duplication and to promote common objectives and standards. Lessons will be learned about converting our nation's roads into electronic thoroughfares. Taking initial steps and managing that process, while both technology and its potential applications evolve rapidly, will be a major challenge.

1.1 BACKGROUND OF ITS

The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) included the concept of Intelligent Vehicle-Highway Systems (IVHS), recognizing that technological applications offered significant potential for improving safety, reducing congestion, and enhancing the overall transportation efficiency in the United States. In 1992, the Strategic Plan for IVHS in the United States[1] identified the following six functional areas as the basis for early IVHS planning and project implementation.

1) Advanced Traffic Management Systems (ATMS)
2) Advanced Traveler Information Systems (ATIS)
3) Advanced Vehicle Control Systems (now Advanced Vehicle Safety Systems, or AVSS)
4) Commercial Vehicle Operations (CVO)
5) Advanced Public Transportation Systems (APTS)
6) Advanced Rural Transportation Systems (ARTS)

Through an evolution of concept development, a National ITS Program Plan was prepared in 1995,[2] thus providing a comprehensive planning reference for ITS and illustrating

how the goals of ITS could be addressed through deployment of inter-related user services. At that time, there were 29 user services identified as part of the national program planning process. These 29 user services were grouped into seven areas of commonality or "user service bundles." The user services and bundles have evolved over time, so there are now 31 user services, which are grouped into seven bundles, as shown below:

1) Travel and Traffic Management
   - 1.1 Pre-trip Travel Information
   - 1.2 En-route Driver Information
   - 1.3 Route Guidance
   - 1.4 Ride Matching and Reservation
   - 1.5 Traveler Services Information
   - 1.6 Traffic Control
   - 1.7 Incident Management
   - 1.8 Travel Demand Management
   - 1.9 Emissions Testing and Mitigation
   - 1.10 Highway-rail Intersection

2) Public Transportation Management
   - 2.1 Public Transportation Management
   - 2.2 En-route Transit Information
   - 2.3 Personalized Public Transit
   - 2.4 Public Travel Security

3) Electronic Payment
   - 3.1 Electronic Payment Services

4) Commercial Vehicle Operations
   - 4.1 Commercial Vehicle Electronic Clearance
   - 4.2 Automated Roadside Safety Inspection
   - 4.3 On-board Safety Monitoring
   - 4.4 Commercial Vehicle Administrative Processes
   - 4.5 Hazardous Material Incident Response
   - 4.6 Commercial Fleet Management

5) Emergency Management
   - 5.1 Emergency Notification and Personal Security
   - 5.2 Emergency Vehicle Management

6) Advanced Vehicle Safety Systems
   - 6.1 Longitudinal Collision Avoidance
   - 6.2 Lateral Collision Avoidance
   - 6.3 Intersection Collision Avoidance
   - 6.4 Vision Enhancement for Crash Avoidance
   - 6.5 Safety Readiness

6.6 Pre-crash Restraint Deployment
6.7 Automated Vehicle Operation

7) Information Management
7.1 Archived Data Function

The "users" of these services include travelers using all modes of transportation, transportation management center operators, transit operators, metropolitan planning organizations, commercial vehicle owners and operators, state and local governments, and many others. As described in the National ITS Program Plan, the user services areas share the following common characteristics and features:

- Individual user services are building blocks that may be combined for deployment in a variety of fashions,
- User services are comprised of multiple technological elements or functions which may be common with other services,
- User services are in various stages of development and will be deployed as systems according to different schedules,
- Costs and benefits of user services depend upon deployment scenarios, and
- Many user services can be deployed in rural, suburban, and/or urban settings.[2]

For the purposes of Kentucky's Strategic Plan, the user services have been grouped under the six original ITS functional areas (ATMS, ATIS, AVSS, CVO, APTS, ARTS) from the U.S. Strategic Plan. Within each functional area, the user service areas most critical to the vision for transportation in Kentucky have been addressed.

It is worth noting that the Archived Data User Service (ADUS), is not directly addressed in this Strategic Plan. This user service was added to the National ITS Architecture in December 1999 and was assigned to its own user service bundle, called "Information Management." When the focus group sessions were conducted and summarized for Kentucky's ITS Strategic Plan, ADUS was not part of the National Architecture; hence, it is not directly addressed in this Plan. However, ADUS will be an important part of Kentucky's ITS program, and it is worthy of specific consideration in future updates of this Plan.

Kentucky has already planned, designed, and implemented many ITS projects. Among these are ARTIMIS (in the Cincinnati and northern Kentucky area), TRIMARC (in Louisville), the Lexington traffic management and traveler information system, Advantage CVO, and CVISN (project descriptions can be found in Section 4.0). In addition, there have been significant ITS activities at Clays Ferry Bridge, the Cumberland Gap Tunnel, and various locations where weather information systems have been installed. There is an obvious need to coordinate and integrate the existing ITS projects (and future projects) to obtain maximum benefit from the experiences gained and technologies evaluated. A Strategic Plan is a means to ensure that ITS technologies are applied wisely in the appropriate transportation projects.

1.2 BENEFITS OF ITS

The traditional approach to providing increased mobility for users of surface transportation facilities has been to expand the system. However, rapidly increasing travel demand has resulted in high levels of congestion on many of our highways, and costs to continue to expand the system are often prohibitive, thus necessitating the consideration of alternatives for restoring mobility. Congestion-related lost productivity has been estimated to cost more than $48 billion annually in the United States.[3] In addition, with over 40,000 people killed and 3 million injured each year, the accident costs are estimated to be $140 billion annually.[4] Excessive costs and environmental concerns will not permit significant expansion of the existing surface transportation system.

ITS applications can improve safety, reduce congestion, and enhance mobility, while minimizing environmental impacts. ITS tools can assist in addressing current problems and meeting future demands through proper planning and managing of transportation systems. Direct benefits can be realized from the effective integration of advanced technologies for communication, control, and information processing into transportation systems. A comprehensive and well-developed plan for incorporating ITS concepts and technologies into Kentucky's transportation planning process offers potential for significant benefits to the overall transportation system.

1.3 PURPOSE OF ITS STRATEGIC PLAN

This ITS Strategic Plan offers a vision for ITS in Kentucky and identifies key goals for each functional area of ITS. The Plan provides an overview of the broad scope of ITS and the potential impact upon traditional approaches to transportation. The relationships among various ITS functional areas and user services are explored in terms of their application to transportation in Kentucky. Each of the functional components of ITS is addressed separately, with sections devoted to mission, vision, and goals.

The Plan also includes discussions of some foundational elements of achieving the ITS vision. Discussions are included on such topics as: public relations and marketing, operations and maintenance, and organizational structure.

Not included in this Strategic Plan Report, but currently being developed, are a statewide ITS Architecture and an ITS Business Plan for Kentucky. The statewide ITS Architecture will document (in a manner consistent with the National ITS Architecture) the user services, subsystems, connections, and information flows necessary to support Kentucky's existing and planned ITS deployments. The ITS Business Plan will take the goals listed in the Strategic Plan and develop a list of recommended projects for implementation in Kentucky, along with estimated costs and a suggested implementation schedule. Also addressed in the Business Plan will be the infrastructure requirements to support statewide ITS deployment. Efforts will be made to ensure that the Business Plan is compatible with the Kentucky Transportation Cabinet's Six Year Plan of proposed projects.

It is anticipated that this ITS Strategic Plan will be updated frequently. While a definitive schedule is not in place for revising and updating the Plan, it is proposed that a permanent and formalized Advisory Committee be assigned responsibility for continued attention to the Strategic Plan.

[1] Strategic Plan for Intelligent Vehicle-Highway Systems in the United States; IVHS America, Washington, D.C.; April 1992.
[2] National ITS Program Plan; Vol. I; ITS America; Washington, D.C.; March 1995.
[3] Intelligent Transportationn Systems; U.S. Department of Transportation, ITS Joint Program Office; Washington, D.C.; Publication No. FHWA-JPO-98-008.
[4] Traffic Safety Facts 1998; National Highway Traffic Safety Administration, U.S. Department of Transportation; October 1999.

2.0 THE NATIONAL ITS ARCHITECTURE

2.1 What is the National ITS Architecture?

The national ITS Architecture can be regarded as a blueprint that guides ITS implementation in the United States. It provides an accepted framework for ITS deployment, specifying how the necessary functionality will be assigned to various system elements and how the various systems will interface and exchange data. By so doing, the architecture helps to ensure that there is interoperability among systems, a seamless flow of information, standardization of equipment, multiple vendors for technology, and maximum benefit from early lessons learned.

A simple analogy to the ITS Architecture is the component-based home audio system. There is a standard architecture for these systems, which spells out the functionality of each component (e.g., tape deck, amplifier, tuner, compact disc player, etc.), the types of connections between the components, and the way that data will flow between them. Because of this standard architecture, a buyer can select components from different manufacturers and different retailers, choosing the price and features that meet his or her needs, and be assured that the components will all work together. This describes the value of having a system architecture.

2.2 The National ITS Architecture Development Process

The need for a national architecture for ITS was identified in the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), which directed the US Secretary of Transportation to promote compatibility among intelligent transportation technologies implemented throughout the United States.

In September 1993, the United States Department of Transportation (USDOT) selected four teams to begin Phase I of the National ITS Architecture Development Program. By October 1994, each team had developed an initial architecture concept and performed a preliminary evaluation of that concept. Following an intensive period of review and evaluation, two teams were selected to continue into Phase II, which was a collaborative effort. Phase II was completed in July 1996 with delivery of the final architecture documentation.

The architecture development process took about three years to complete, with a total cost of approximately $18 million.[1] Since the delivery of the architecture in 1996, it has continued to be updated. The latest version (3.0) became available in December 1999.

2.3 Content of the National ITS Architecture

The National ITS Architecture Documentation consists of over 5,000 pages, organized into 17 documents. A list of these documents is provided below. A description of each document can be found in the National ITS Architecture Executive Summary.[2]

Architecture Documents:

Executive Summary	Cost Analysis
Vision	Performance and Benefits Study
Mission Definition	Risk Analysis
Logical Architecture	Evaluation Results Summary
Physical Architecture	Implementation Strategy
Theory of Operations	Market Packages
Traceability Matrix	Standards Development Plan
Communications Document	Standards Requirements Document
Evaluatory System Design	

2.4 Implications of the National Architecture to Kentucky

ITS technologies in Kentucky should be implemented in a manner consistent with the national architecture. Such consistency ensures that Kentucky's systems will be interoperable with systems throughout the country. It also maximizes the availability of off-the-shelf technology and increases the probability of having multiple vendors available. System designers and implementers benefit from the experience of earlier projects, and are able to minimize the possibility of overlooked requirements and unexpected problems. Through the use of standard interfaces with other systems, the costs and difficulties associated with sharing data between systems are minimized.

2.5 Sources of More Information

There is extensive documentation available on the National ITS Architecture. The full documentation set consists of over 5,000 pages of information. For those who desire a more cursory understanding, there is a 24-page executive summary that provides a solid overview. Any of the documents can be downloaded from the following site on the world wide web:

http://www.odetics.com/itsarch

An additional source of information is the U.S. Department of Transportation's ITS web site at:

http://www.its.dot.gov

[1] Inside ITS; Transport Technology Publishing; New York, NY; July 1, 1996
[2] National ITS Architecture Documentation; Executive Summary

3.0 INFRASTRUCTURE AND APPLICABLE TECHNOLOGIES

3.1 NATIONAL ITS INFRASTRUCTURE

As many state and local governments implement ITS technology, it is critical that these systems have some underlying foundation that connects them all. To promote compatibility and integration among these systems, the US Department of Transportation (USDOT) has published the "Intelligent Transportation Systems Infrastructure Initiative".[1]

The USDOT refers to the ITS infrastructure as the "information and communications backbone" to an ITS system. It is not merely a collection of technologies, but a system that allows for communication among technologies. It is that link between various ITS systems that creates the appearance of a single multimodal, multi-jurisdictional system. The USDOT's ITS Infrastructure Initiative focuses on the needs of metropolitan travelers, rural travelers, and commercial vehicle operators.

Infrastructure for metropolitan users will combine the components of traffic management, traveler information, and public transportation. Technology applications focus on nine different services, including: traffic signal control, freeway management systems, transit management systems, incident management programs, electronic toll collection, electronic fare payment systems, emergency response, and regional multimodal traveler information systems. The USDOT's objective in this area is to deploy ITS infrastructure in 75 of the nation's largest metropolitan areas.

The rural infrastructure will serve to improve transportation conditions in rural areas and may include applications from the five functional areas of ATMS, ATIS, CVO, APTS, and AVSS. There are seven areas of application for the rural traveler: traveler safety and security systems, emergency services, tourism and travel information services, public traveler services/public mobility services, infrastructure operation and maintenance technologies, fleet operation and maintenance systems, and commercial vehicle operation systems. The USDOT plans to deploy these elements as needed.

The CVO infrastructure will include technology from the areas of: commercial vehicle electronic clearance systems, automated roadside safety inspection systems, onboard safety monitoring, commercial vehicle administrative processes, freight mobility systems, and hazardous materials incident response technologies. The objective is to deploy ITS infrastructure for commercial vehicles in all 50 states.

As summarized from the ITS Infrastructure Initiative, in order to reach each objective for metropolitan and rural travelers and commercial vehicle operators, the USDOT will:

1. Communicate the benefits to decision makers and agencies and encourage integration through a showcase of ITS infrastructure in metropolitan areas and for commercial vehicles through the Model Deployment Initiative (MDI),

2. Encourage integration with creative funding incentives targeted at ITS integration in metropolitan areas and for commercial vehicles and basic deployment elsewhere,

3. Provide training courses for transportation officials to enhance their professional capacity,

4. Provide documentation and technical assistance on the deployment of ITS infrastructure and the use of the National Architecture for state and local officials, and

5. Facilitate the development of ITS standards and require that federal funding be used only on projects that comply with these standards and the National Architecture.

3.2 KENTUCKY ITS INFRASTRUCTURE

Kentucky has already deployed a significant amount of ITS infrastructure, and continues to do so. To date, the state is involved with more than 20 ITS projects (see section 4.0 for details).

Metropolitan infrastructure in Kentucky may be seen in Louisville, northern Kentucky, and Lexington. All three areas use similar technology for traffic and incident management, including: dynamic message signs, detailed reference markers, highway advisory radio, and closed circuit cameras. Both Louisville and Lexington use computerized signal systems.

Rural infrastructure may be seen in various parts of the state. Closed circuit cameras and dynamic message signs are used at the Cumberland Gap Tunnel. Road Weather Information Systems (RWIS) are implemented in eight different areas around the state, providing information to a centralized location.

As a Model Deployment State for the Commercial Vehicle Information Systems and Networks (CVISN) program, Kentucky has implemented substantial infrastructure for commercial vehicle operations. Six different weigh stations have been equipped with automatic vehicle identification (AVI) readers, allowing electronic identification and mainline screening of transponder-equipped commercial vehicles. All of Kentucky's weigh stations have been connected to a wide area network (WAN), allowing high-speed data communications and Internet access. A"remote monitoring system" (RMS) has been installed for testing in northern Kentucky. This system allows enforcement personnel to covertly monitor commercial vehicle traffic from a remote location. Kentucky has also implemented the capability for electronic application for registration and tax-related credentials, as well as the electronic filing of fuel tax returns. This electronic credentialing capability will be expanded to additional carriers and additional types of credentials.

For communication among the state's ITS systems, Kentucky is investigating the deployment of a statewide fiber optic network. This is anticipated to be a shared resource project with one or more telecommunications provider(s). The fiber would be installed along the right-of-way of various major roadways throughout the state. The erection of cellular towers on the

right-of-way is also being considered. These communication systems would allow the state to have a seamless method of communication among all its ITS applications.

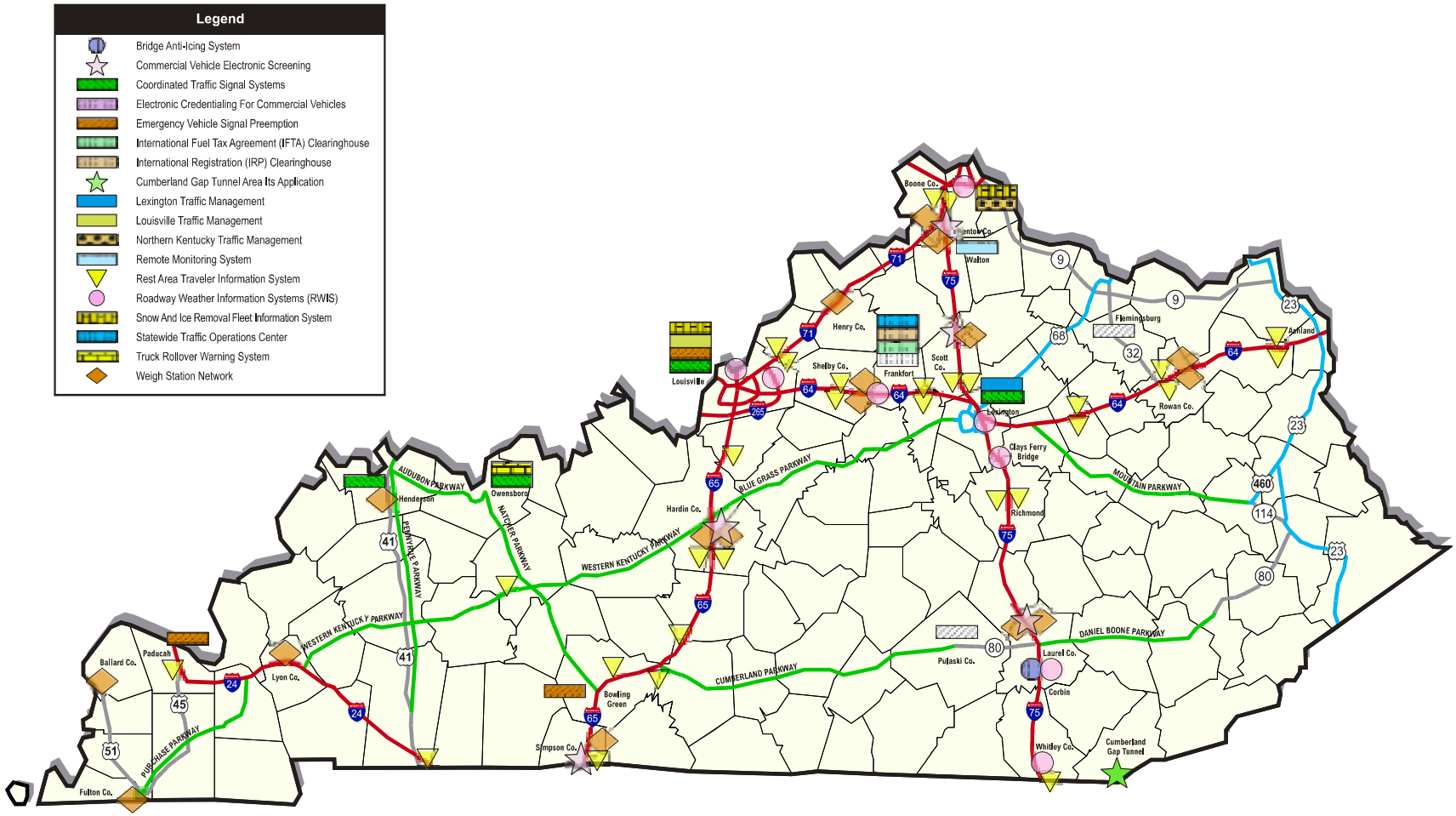
Additional information on ITS infrastructure will be contained in Kentucky's ITS Business Plan (scheduled for release in April 2001).

[1] Intelligent Transportation Systems Infrastructure Initiative. U.S. Department of Transportation. Intelligent Transportation Systems Joint Program Office. October 1, 1997. Publication No. FHWA-JPO-97-0028.

4.0 ITS IN KENTUCKY

The use of ITS in Kentucky began in 1982 with the implementation of a computerized traffic signal system, vehicle detection loops, and a closed circuit camera system in Lexington. Today, there are many ITS-related projects in operation or in development throughout the state, involving traveler information, traffic management, public transportation, and commercial vehicle operations. The map on page 4-3 shows the locations of current ITS projects in Kentucky. The pages following the map contain a one-page synopsis of each project, including a project description, status, responsible agencies/partners, funding arrangements, physical location, technologies, and future applications for the project.

Kentucky
Intelligent Transportation Systems (ITS) Program



ADAPTIR (Automated Data Acquisition and Processing of Traffic Information in Real-time) Safety Warning System in Work Zones

Project Description

The purpose of the ADAPTIR system is to acquire traffic data and provide real-time motorist information in a construction zone without operator intervention. The motorist information is displayed on dynamic message signs (DMS) equipped with radar units. These DMS display the appropriate warning and advisory messages to motorists approaching a work zone when certain speed and delay thresholds are met. The messages warn the drivers that speeds are reduced ahead and that delays are "x" minutes. When delays become excessive, they advise motorists to use an alternate route. This system operates automatically, without the intervention of any personnel to prompt the messages.

Status

The contract was completed in September 1999.

Responsible Agencies/Partners

Kentucky Transportation Cabinet, Federal Highway Administration, Scientex Corporation, and the Kentucky Transportation Center.

Funding Arrangements

Total Cost: $500,000
Federal Funding: 80%
State Funding: 20%

Physical Location

The system was located on Interstate 64 in Franklin County, Kentucky. The system was removed after completion of the highway construction.

Technologies

The system used dynamic message signs, a software program to interpret the data, and radar units.

Future Applications

This system can provide real-time traffic information to the traveling public in work zones; however, due to the high cost of the system, it should be limited to high volume roads where significant delays are anticipated and where acceptable alternate routes are available.

Bridge Anti-Icing System

Project Description

The anti-icing bridge deck system is used to disperse chemicals on the roadway to prevent the formation of a bond between the snow/ice and the bridge deck surface. By applying the deicing chemical before this bonding occurs, the snow/ice removal process is accomplished more efficiently.

The system uses a Road Weather Information System (RWIS) in conjunction with a camera system for detecting and verifying surface and atmospheric conditions. Authorized personnel can activate the system remotely or at the bridge.

Status

The bridge system has been operational since the winter of 1997-1998 and the evaluation will be completed by December 2000.

Responsible Agencies/Partners

Kentucky Transportation Cabinet, Federal Highway Administration, Kentucky Transportation Center, and Odin Systems.

Funding Arrangements

Total Cost: $65,000
Federal Funding: 80%
State Funding: 20%

Physical Location

Southbound bridge on I-75 at exit 29 in Corbin, Kentucky.

Technologies

The bridge anti-icing system includes a nozzle and spray system mounted in the bridge rails. A fluid storage tank, pump, and delivery system installed at one end of the bridge deck delivers the anti-icing fluid to the nozzles. A video camera system permits monitoring site conditions and system operations remotely. Portable dynamic message signs are used to alert drivers that spraying is possible on the bridge deck.

Future Applications

Decisions regarding future applications will be made after the evaluation period.

Commercial Vehicle Electronic Screening

Project Description

As Lead State in the Advantage CVO Project, Kentucky was instrumental in deploying the Mainline Automated Clearance System (MACS) at 29 weigh stations from Florida to Ontario, including four sites in Kentucky. MACS performs mainline screening of commercial vehicles using truck-mounted transponders, roadside readers, a screening database resident in a weigh station computer, and (in some cases) mainline weigh-in-motion equipment.

Status

Since the end of the formal Advantage CVO Project, Kentucky has continued to operate MACS on Interstate-75 and is expanding to additional sites. Kentucky has also developed an updated and enhanced version of MACS (called "Model MACS"), which is being shared with other states.

Model MACS is operational on I-75, at two additional sites on northbound I-65, and at the Seymour, Indiana site (also on northbound I-65). Additional sites are included in the Six-Year Highway Plan. The software for the enhanced system, developed for Kentucky by TRW, Inc., has been provided to three other states and will be provided to others as requested.

Kentucky now participates in the North American Preclearance and Safety System (NORPASS) partnership for the promotion and advancement of commercial vehicle electronic screening.

Responsible Agencies/Partners

Kentucky Transportation Cabinet, Federal Highway Administration, Kentucky Transportation Center, TRW, Inc., TransCore, Inc., and the NORPASS Partnership.

Funding Arrangements

Total cost has been upwards of $20 million, which developed MACS and deployed it to seven different jurisdictions. For the Advantage CVO Project, many of the expenditures received 80% FHWA funding, with the remainder of the costs being borne by the States.

Physical Location

MACS is currently deployed at the Laurel, Scott, and Kenton County weigh stations on I-75 and at the northbound Simpson and Hardin County sites on I-65.

Technologies

MACS depends on dedicated short-range communications (DSRC) technology, which includes a windshield-mounted transponder and a roadside reader. The transponder and reader communicate with each other via radio frequency transmissions. Some sites are also equipped with weigh-in-motion scales that can weigh a truck at highway speeds.

Future Applications

MACS could become the predominant method of screening trucks at weigh stations and could also spread to other locations, such as mobile or temporary enforcement sites.

Coordinated Traffic Signal Systems

Project Description

Coordinated traffic signal systems reduce travel times and vehicle operating costs by maximizing the efficiency of existing streets. These systems improve traffic flow on a day to day basis as well as for special events and emergencies. This in turn reduces emissions, thus improving air quality in these cities.

The systems can continually measure traffic conditions and automatically adjust signal timing. The systems can also analyze traffic information, display traffic conditions, and report any problems with the signal equipment. The data collected allows the traffic engineering staff to continuously monitor the traffic conditions and make signal timing adjustments to correct for incidents or special events.

Status

The signalized systems are completed and operating in various communities.

Responsible Agencies/Partners

Kentucky Transportation Cabinet, Federal Highway Administration, and the various cities that have the coordinated signals (see below).

Funding Arrangements

Total Cost: Varied for each city
Federal Funding: 80 %
State and City Funding: 20 %

Physical Location

Systems are located in Lexington, Louisville, Henderson, and Owensboro.

Technologies

The technologies vary for the different cities. However, the “170" controllers and the Wapiti firmware are similar for Lexington and Louisville.

Future Applications

Possible expansion to additional signals and/or additional communities.

Electronic Credentialing for Commercial Vehicles

Project Description

As a Model Deployment State for the Commercial Vehicle Information Systems and Networks (CVISN) program, Kentucky is developing and implementing the capability for commercial motor carriers to apply for and receive their operating credentials and file tax returns electronically.

Status

Working through a commercial software/system provider, Intelligent Decision Technologies (IDT), Inc., Kentucky has developed and implemented an Intercat™ software package. Currently, the package provides full International Registration Plan (IRP) functionality and partial International Fuel Tax Agreement (IFTA) functionality. Approximately five to ten carriers are currently using the software for their IRP credentials, and two carriers used it for their fourth quarter 1999 IFTA filings.

In addition, Kentucky has developed a web-based capability for IRP credentials. This system, called WebCat, currently has limited functionality and is in beta testing with two carriers.

Responsible Agencies/Partners

Kentucky Transportation Cabinet; Federal Highway Administration; IDT, Inc.

Funding Arrangements

Federal funding being provided through CVISN program, with 50/50 state match.

Physical Location

Credentialing systems in Frankfort are accessible from the motor carrier's desktop computer or from anywhere with Internet access.

Technologies

Internet, electronic data interchange.

Future Applications

Full IRP functionality is expected for the WebCat by mid-2000. IFTA functionality will continue to be upgraded until full functionality is achieved for both Intercat and WebCat. Currently developing a business case for electronic funds transfer. In future, will develop electronic capabilities for oversize/overweight permitting and intrastate registration.

Emergency Vehicle Signal Preemption

Project Description

Several communities in Kentucky have implemented systems to provide preemption of traffic signals for emergency vehicles. When the signal is triggered, the emergency vehicle and all traffic flowing in the same direction get a green light. Opposing lanes of traffic receive a red light.

Status

Existing

Responsible Agencies/Partners

The KyTC is involved primarily because they control the traffic signals. They supervise to make sure the preemption equipment does not cause problems for the traffic signals. In most locations, the city and/or the fire department implements and maintains these systems.

Funding Arrangements

These systems are funded by the cities in which they are deployed or by the fire department within those cities.

Physical Location

60-65 Intersections in Bowling Green
1 Intersection in Louisville (2 more are planned)
2 Intersections in Flemingsburg
1 Intersection in Pulaski County
2 Intersections in Paducah

Technologies

The technologies used for these systems vary from city to city. In general, the preemption occurs in one of two ways. The signal may be preempted when a dispatcher or someone in the fire department activates the system. Or, the emergency vehicle is equipped with a transmitter that activates the preemption as the vehicle approaches the signal.

Future Applications

The Middletown Fire District in Louisville has plans to implement this type of system at two additional intersections. Other communities may also have plans for installation or expansion.

Infrared Brake Testing Technology

Project Description

Kentucky is participating, along with other states, in a test of a system that uses infrared sensing technology to evaluate the performance of truck brakes. This Infrared Inspection System (IRIS) can evaluate truck brakes while the vehicle is in motion and provide a reliable indication of brake deficiencies.

Status

The system is currently in operation and is rotating (every 30 to 60 days) among the participating states. At the end of June 2000, Battelle, Inc., will prepare an evaluation report. The system will continue to rotate among the participating states until May 2001.

Responsible Agencies/Partners

Federal Motor Carrier Safety Administration (FMCSA); Kentucky Transportation Cabinet; Tennessee Department of Safety; North Carolina Commercial Vehicle Enforcement; Georgia Public Service Commission; Battelle, Inc.

Funding Arrangements

$270,000 grant from USDOT (ITS and MCSAP funds)
20% State match being provided by way of training and man-hours.

Physical Location

GMC Safari van. Rotating (every 1-2 months) to each state.

Technologies

A GMC Safari van, equipped with video cameras with infrared and standard imaging.

Future Applications

Kentucky takes full possession of the IRIS van in May 2001.

International Fuel Tax Agreement (IFTA) Clearinghouse

Project Description

Kentucky participates in a partnership with other states to provide a clearinghouse for data related to state fuel taxes for commercial vehicles. Prior to IFTA, motor carriers operating in multiple states had to file a quarterly tax return (and remit taxes) to each state in which they operated. IFTA allows the carrier to file a single tax return (and a single payment) to their base state and have the funds disbursed appropriately to the various states in which that carrier operated. The IFTA clearinghouse allows for electronic exchange of data as to what carriers are delinquent or paid-up on fuel taxes and the number of miles reported by each carrier in each jurisdiction.

Status

IFTA, Inc. is finalizing an access agreement to be sent to each member jurisdiction for signature. Once the agreement is signed, the Regional Processing Center (RPC) should have Kentucky up and operating (with electronic access to the clearinghouse) within 30-45 days. Thus, Kentucky anticipates being operational by August or September of 2000.

Responsible Agencies/Partners

Kentucky Transportation Cabinet, IFTA, Inc., Regional Processing Center.

Funding Arrangements

Not fully defined. Building of clearinghouse was paid for by IFTA, Inc., using Federal funds. Kentucky's access is through a dedicated line with the RPC, paid for with State funds.

Physical Location

Kentucky's IFTA databases and servers are in Frankfort. The Regional Processing Center is in Albany, New York.

Technologies

Electronic Data Interchange.

Future Applications

Anticipate full electronic data exchange.

International Registration Plan (IRP) Clearinghouse

Project Description

Kentucky participates in a partnership with other jurisdictions to provide a clearinghouse for the transfer of data and fees (related to commercial vehicle registration) electronically through a single point. Each IRP jurisdiction is required to supply recap and transmittal reports, along with fees collected, to all other IRP jurisdictions within 45 days of collection. For jurisdictions not participating in the clearinghouse, hardcopy documents along with checks are mailed monthly. Thus, the clearinghouse eliminates the necessity to mail hardcopy documentation and checks to multiple jurisdictions. Data is sent electronically once a month to the clearinghouse database, fees are netted on the 15th of the month, and any fees due are transferred electronically. The true benefit of the system will be seen once all jurisdictions are participating.

Status

Kentucky has been a participant in the IRP Clearinghouse since January 1999.

Responsible Agencies/Partners

Kentucky Transportation Cabinet, IRP, Inc.

Funding Arrangements

Funding thus far has been through FHWA and the American Association of Motor Vehicle Administrators. Participating jurisdictions will begin paying to participate in October 2001. Anticipated cost for Kentucky is about $8,000 per year.

Physical Location

Kentucky's IRP databases and servers are located in Frankfort.

Technologies

Electronic Data Interchange

Future Applications

None identified.

ITS Applications in the Vicinity of the Cumberland Gap Tunnel

Project Description

The purpose of adding ITS applications in the vicinity of the Cumberland Gap Tunnel is to improve the safety and efficiency of travel through the Tunnel.

Status

Operational. Negotiations are underway for additional ITS applications in the region.

Responsible Agencies/Partners

National Park Service (Facility Owner); Federal Highway Administration; Kentucky Transportation Cabinet (Operations and Maintenance); Tennessee Department of Transportation (Operations and Maintenance); Vaughn & Melton (Contract Administration); Parsons, Brinckerhoff, Quade and Douglas (Design); Walsh Construction; Archer-Western Contractors (DBA Construction); Cumberland Gap Tunnel Authority (Tunnel Management); and ITS Subcontractors/Vendors (SESCO, Traffic Management Associates, Johnson Control, Simplex, and M.B. Nixon)

Funding Arrangements

Total cost of Tunnel and ITS Applications was $265 million.
Funding for Additional ITS Applications is $6.7 million.

Physical Location

Cumberland Gap National Historical Park in Bell County, Kentucky and Claiborne County, Tennessee (includes 4600 foot twin tunnels and approach roads).

Technologies

Dynamic message signs and lane use signals communicate with drivers approaching the Tunnel. Messages typically relate to escorting HAZMAT vehicles through the Tunnel, but some of the signs can be programmed for any use. There are also variable speed limit signs for changing the speed limit during hazardous conditions or emergencies. Closed circuit cameras allow personnel in the control room to view activities within the Tunnel, while magnetic loop detectors monitor the traffic and continuously count the vehicles.

Future Applications

Additional funding has been secured for expansion of the ITS applications in the vicinity of the Cumberland Gap Tunnel. This funding will be used to improve traffic management and traveler information related to the operation of the Tunnel, congestion and incidents related to handling of HAZMAT trucks passing through the Tunnel, other incidents, weather-related problems, and tourist/attractions information. Technologies that will be added to the Tunnel and surrounding region may include: closed circuit cameras, dynamic message signs, highway advisory radio, Road Weather Information Systems, automatic vehicle location and/or identification of HAZMAT vehicles, and a radio rebroadcast system.

Laptops and Wireless Communications for Roadside Commercial Vehicle Safety Inspections

Project Description

The Division of Vehicle Enforcement of the Kentucky Transportation Cabinet is currently equipping their enforcement vehicles with laptop computers and mobile communications technology to assist officers in accessing accurate, timely data to identify high-risk motor carriers, vehicles, and drivers. The technology also expedites the process of conducting commercial vehicle inspections and uploading inspection results to appropriate state and national databases.

Status

Kentucky currently has 20 laptops installed in vehicles, with another 50 in-house (to be installed by June 2000. These laptops provide access to motor carrier safety regulations, all Kentucky Revised Statutes, and all Hazardous Materials rules. They include the capability to print inspection reports (driver's copy) and to scan documents into the inspection record. Currently, officers go to a weigh station once a day to download data and upload inspections via an ethernet connection. Efforts have been initiated to hire a consultant to evaluate options (and develop recommendations) for wireless communications.

Responsible Agencies/Partners

Kentucky Transportation Cabinet

Funding Arrangements

Funding for this program is being provided through the Empower Kentucky initiative and the Commercial Vehicle Information Systems and Networks (CVISN) Program

Physical Location

Laptop computers are deployed in enforcement vehicles throughout the state.

Technologies

Laptop computers, printers (with scanning capability), mobile communications.

Future Applications

A Strategic Alliance Service Request (SASR) is being prepared to hire a consultant to conduct a six-month evaluation of Kentucky's wireless communications options and develop a recommended solution. If desired, Kentucky will then hire a system integrator to assist in implementing the recommended solution for two-way mobile data communications. This will provide enforcement officers with access to real-time data and immediate upload of inspections.

Lexington Traffic Management and Traveler Information

Project Description

The ITS applications in the Lexington-Fayette County area help to provide the best possible transportation system through improved traffic management and traveler information.

Status

Operational. Work in progress includes installing a PC-based NT system to control the city's traffic signals (replacing the legacy system), and installing fiber optic cable to replace the existing voice-grade telephone line communications. The Division of Traffic is also beginning to install wireless communication units and additional video vehicle detection cameras, and will complete an LED change-out of all red traffic signal lenses during the year 2000.

Responsible Agencies/Partners

Lexington-Fayette Urban County Government (LFUCG), the Lexington Area Metropolitan Planning Organization, the Transit Authority of Lexington, 22 radio and 4 television stations, other government agencies, GTE Wireless, Insight Communications, and GTE.

Funding Arrangements

Total Costs - $2,100,000

80% Federal Funds - $1,700,000

20% Local Funds - $400,000

Technologies/Physical Location

Urban Traffic Control System (UTCS) including 310 signalized intersections in the Lexington area; closed circuit television cameras monitoring 34 intersections in Lexington with two cameras at the Clays Ferry Bridge; reversible lane system along Nicholasville Road in Lexington; Traffic Information Network (TIN) serving Fayette County and 43 surrounding counties; two Electronic Total Stations used by Lexington Police; Road Weather Information System (RWIS) stations located at the Clays Ferry Bridge and the south junction of I-64/I-75; 88 flip-down signs along I-64, I-75, and various alternate roadways in Central Kentucky; 234 detailed reference markers along I-75 and 122 along I-64 through Lexington and the surrounding areas; video vehicle detection; fiber optic cable being installed; Geographic Information Systems (GIS); web site; *311 cellular access; detour routing; cable TV program; preformed loops; weather station access; dynamic message signs and arrow boards being used by Police

Future Applications

An Automated Incident Detection System has been funded and will begin in the second half of this year. A grant to provide for Traffic Signal System Integration has been approved and is planned for late 2000 or early 2001.

Louisville Traffic Management and Traveler Information (TRIMARC)

Project Description

The TRIMARC (Traffic Response and Incident Management Assisting the River Cities) project provides improved management of incidents and traffic in the Louisville, Kentucky and southern Indiana area. The system includes an array of strategies to improve incident detection and verification, response time, site management, clearance time, and motorist information. Travel times are reduced by notifying motorists of delays and offering alternate routes.

This project used a system integrator approach for the integration, installation, operation, and maintenance of the contract. For this contract, the system integrator was to procure all equipment and services under the FHWA Special Experimental Project No. 14 (SEP-14). The system integrator will maintain the project for a 10-year period.

Status

Operational. The original contract has been extended to cover a larger portion of the TRIMARC area. This additional work includes installing more cameras, dynamic message signs, and reference markers. This additional work should be completed in June 2000.

Responsible Agencies/Partners

Kentucky Transportation Cabinet, Indiana Department of Transportation, Federal Highway Administration, Kentucky Transportation Center, TRW Inc., HNTB, Spartan Construction Company, and Bluegrass Electric.

Funding Arrangements

Total Cost: $29.1 million
Federal Funding: 80%
Kentucky State Funding: 10%
Indiana State Funding: 10%

Physical Location

Interstate 65 from Fern Valley Road in Louisville, Kentucky to State Route 311 in southern Indiana; a section of Interstate 264 (Watterson Expressway).

Technologies

Cameras are used to monitor sections of the project area in order to verify/detect incidents or traffic congestion. Dynamic message signs are installed in key areas to inform motorist of roadway information. A highway advisory radio and an Internet web site are also available for motorists to obtain traffic conditions. A Road Weather Information System (RWIS) is used to identify surface conditions on the Kennedy Bridge over the Ohio River. Detailed reference markers are displayed every two-tenths of a mile to improve the ability of emergency response teams to locate an incident. Traffic control personnel use the electronic detection system to verify incidents. Police use the total station accident investigation equipment to investigate incidents.

Future Applications

Not identified.

Northern Kentucky Traffic Management and Traveler Information (ARTIMIS)

Project Description

The purpose of the Advanced Regional Traffic Interactive Management and Information System (ARTIMIS) in the Cincinnati-northern Kentucky area is to improve the overall safety of travelers and decrease travel time while improving air quality.

Status

Operational.

Responsible Agencies/Partners

Kentucky Transportation Cabinet; Ohio Department of Transportation; Federal Highway Administration; OKI Regional Council of Governments; the City of Cincinnati; TRW; Pflum, Klausmeier,& Gehrum; Proudfoot Associates; Samaritania; SmartRoute Systems; TEC Engineering; JHK & Associates; Alcatel NA; W.G. Fairfield; Spartan Construction; and C.R. & R. Inc.

Funding Arrangement

Total Cost (through 9/30/00) - $46 million
- Federal Funding - 80%
- State Funding - 20%

Physical Location

Approximately 88 miles of freeway in the Cincinnati-northern Kentucky area.

Technologies

67 closed circuit and slow-scan cameras are installed on freeways and interchange ramps in the Cincinnati-northern Kentucky area for incident verification. An electronic detection system, using 1100 inductance loops, wide-beam radar detection units, and video detectors, also provides incident detection. 43 dynamic message signs, along with highway advisory radio, inform motorists of possible delays and alternate routes. A traffic advisory telephone system provides current and route-specific information in the area, and freeway service patrol vans aid motorists and detect incidents.

Future Applications

In the future, the management system could be expanded to cover a larger area. An additional 34 miles of freeway may be equipped with fiber optic cable, closed circuit television cameras, and incident detection equipment. The actual coverage area of the ARTIMIS system would be extended to an additional 119 miles of freeway. Officials are also considering establishing a cable television channel to broadcast live reports of traffic conditions, including delays and alternative routing. Additional technologies that may be added include: RWIS, kiosks, and ramp metering.

Remote Monitoring System

Project Description

The Remote Monitoring System (RMS) is intended to improve commercial vehicle enforcement activities on US 25 in Walton, KY, a potential bypass route of the southbound weigh station on I-75 in Kenton County. By utilizing an image capturing system, officers at the Kenton County weigh station are able to monitor truck traffic on US 25 just South of KY 14.

The RMS concept addresses the problem of truckers avoiding fixed and mobile enforcement activities. This is accomplished via permanent installation of surveillance equipment that can be monitored remotely. The equipment is continuously present, so the truckers do not know when the site is being monitored.

Status

Equipment installed and under evaluation. Expect full operation by July 2000

Responsible Agencies/Partners

Kentucky Transportation Cabinet, Federal Highway Administration, Kentucky Transportation Center, Transfomation Systems, Inc., and Computer Recognition Systems

Funding Arrangements

Total anticipated cost: $211,965

Funded through CVISN (50% Federal, 50% State)

Physical Location

Southbound lane of US 25, just south of KY 14 in Walton, Kentucky

Technologies

Two black and white cameras are used to capture eight images of a commercial vehicle as it travels southbound on US 25. When the infrared height detector and an in-pavement loop detector are triggered, four close-up images are taken of the side of the vehicle and four wide-angle images are taken of the front of the vehicle. These images are sent to the nearby weigh station, where they can be reviewed on a computer by an enforcement officer or clerk.

Future Applications

This first installation will serve as an evaluation of the concept and technology. Additional remote monitoring systems may be deployed throughout the state after the evaluation. Future sites may be deployed in conjunction with weigh-in-motion systems, allowing officers to identify potential overweight vehicles. They may also incorporate optical character recognition, allowing automatic identification of potential violators.

Rest Area Traveler Information

Project Description

The rest area traveler information project provides the public with travel information at 29 rest areas throughout the state. The information is available on monitors that display maps showing highway construction areas on the interstates, parkways, and other selected routes. The monitors also show the driving conditions for winter storm events and provide limited incident management information.

Status

Operational.

Responsible Agencies/Partners

Kentucky Transportation Cabinet, Data Transmission Network Corporation, and Earth Satellite Corporation.

Funding Arrangements

Total Cost: $80,000 / year
Federal Funding: 80%
State Funding: 20%

Physical Location

The traveler information monitors are located in all 29 rest areas throughout the state.

Technologies

An Advanced Communications Engine (ACE), a color graphics receiver system, provides the information and communication services to the television monitors that display the information. The ACE receiver has three processors, dedicated to: (1) data communications and storage; (2) data processing, user interaction, and display; and (3) handling of audio clips. The computer software provides the capability to individually address each receiver unit at the rest areas. A full complement of satellite imaging, remote sensing, and geographic information systems (GIS) technologies are used for coding the graphic maps.

Future Applications

In the future, the monitors will provide information on incident management, real-time traveler information, and video imaging. Also, more locations will be added, and Interstate/Parkway information (e.g. I-75 and I-65 corridor) will be reported to surrounding states to aid motorists traveling through the state.

Road Weather Information Systems (RWIS)

Project Description

The Road Weather Information System (RWIS) is designed to monitor weather-related parameters, including air and pavement temperatures, relative humidity, precipitation, ice formation, and wind speed/direction. Highway maintenance personnel use the data received from these stations to enable more timely treatments of roadways. The Transportation Cabinet can also use this information to notify the public of changing weather and roadway conditions.

Status

There are eight RWIS completed. Ten additional equipment sets have been received, but are not yet installed.

Responsible Agencies/Partners

Kentucky Transportation Cabinet, Federal Highway Administration, and the Kentucky Transportation Center.

Funding Arrangements

Total Cost: $680,000
Federal Funding: 80 %
State Funding: 20 %

Physical Location

I-75 Clays Ferry Bridge
I-75 and I-64 Interchange, East of Lexington
I-275 and KY 17 Interchange, Covington
I-265 and KY 1447 (Westport Road) Interchange, Louisville
I-65 Kennedy Bridge, Louisville
I-75 and US 25E Interchange, Corbin
I-64 and Kentucky River Bridge, Frankfort
I-75 at Northbound Welcome Center, Whitley County (under construction)

Technologies

The RWIS includes a remote processing unit (RPU), a wind speed and direction sensor, air temperature/relative humidity sensor, a subsurface temperature sensor, a surface temperature and condition sensor, a weather identifier, and a video camera (snapshot only).

Future Applications

The Transportation Cabinet hopes to purchase remote digital cameras and install one or two at each RWIS site. An installation/maintenance contract should be in place during the summer of 2000. The Cabinet also hopes to add visibility monitoring. Two-way exchange of information with the National Weather Service is anticipated. In addition, RWIS data can be put on an FTP server so that anyone can have access. User access will be graphical via a browser and will include digital images.

Snow and Ice Removal Fleet Information System

Project Description

This project is designed to enhance the ability of the Cabinet to manage winter storm operations and enable inter-jurisdictional coordination of the snow management efforts. It is a unique integration of automatic vehicle location (AVL) technology using global positioning systems (GPS), geographic information systems (GIS), and cellular digital packet data (CDPD) communications. System software supports near real time monitoring and management of snow and ice removal operations by storm managers.

Status

This project is currently being installed and tested.

Responsible Agencies/Partners

Kentucky Transportation Cabinet, SRF Consulting Group, GTE Wireless

Funding Arrangements

Total Funding - $269,951

80% Federal Funds

20% State Funds

Physical Location

This technology has been installed on 20 snow removal vehicles, 10 in Highway District 5 (Louisville area) and 10 in Highway District 6 (Covington area).

Current Technologies

The vehicles are equipped with the following items: mobile data computer (MDC), GPS receiver and antenna, CDPD modem and antenna, infrared pavement temperature sensor, plow up/down switch, spreader on/off switch, electrical power and signal cables. The vehicles communicate with the host workstations via CDPD. The host end equipment consists of Windows NT workstations.

Future Applications

After the project has been evaluated, more vehicle units may be implemented in the Louisville and Covington districts, with possible expansion to other districts. During non-winter months, this technology may be used with service patrol vans. The traffic management control centers at ARTIMIS and TRIMARC will have the AVL operational software for communications and dispatch. Other uses of this technology in non-winter months may include the tracking of traffic stripers, maintenance sweepers, pothole crews, and traffic electricians.

Statewide Traffic Operations Center

Project Description

The Statewide Traffic Operations Center (STOC) will provide a centralized location to coordinate traffic operations and commercial vehicle enforcement activities throughout the entire state, thus providing improved communications and data sharing among state agencies, improved management of incidents, and improved provision of travel-related information to the traveling public. The STOC will be interconnected with the regional operations control centers (ROCCs) around the state, allowing the exchange of up-to-date information.

Status

The functional design report has been completed and delivered. Implementation of the STOC is anticipated for approximately calendar year 2004.

Responsible Agencies/Partners

Kentucky Transportation Cabinet, Lexington Fayette Urban County Government, ARTIMIS Control Center, TRIMARC Control Center, Cumberland Gap Tunnel Control Center, Deloitte Consulting, and Parsons-Brinkerhoff.

Funding Arrangements

Total Cost: $740,000 (100% State Funding**)**

Physical Location

Short-term improvements will be in the existing State Office Building. The STOC will be in the new Transportation Building.

Technologies

For communications, the STOC will use a comprehensive structured cabling system, a private branch exchange (PBX) system, a local area network (LAN), and an automatic vehicle location (AVL) system. For transportation operations, technologies include an information exchange network, an ITS control system, control and monitoring of dynamic message signs (DMS), data collection and monitoring of remote sensors, an ITS maintenance management system, and a transportation video system. The Vehicle Enforcement Dispatch Center will use computer aided dispatch (CAD), access to NCIC and NCIC2000, wireless voice communications, and wireless data communications. A video wall and multiple workstations will be provided.

Future Applications

Anticipate two-way information exchange between STOC and ROCCs, with data from ROCCs included on Kentucky's Internet website. STOC will migrate to being a "backup operations center" for the ROCCs. Use may be made of the existing Kentucky Information Highway (KIH) IP based networking infrastructure, and may see fiber deployed along highway rights-of-way. Expect integration of information exchange, operations, and traveler information services for ITS projects throughout Kentucky. Expect strategic, statewide deployment of dynamic message signs and deployment of a highway advisory radio (HAR) network.

Truck Rollover Warning System

Project Description

The purpose of the Truck Rollover Warning System is to reduce the number of truck rollovers on the Natcher Parkway exit ramp to the Owensboro Bypass. A "TRUCKS REDUCE SPEED" sign is illuminated when a truck is detected exceeding a specified speed.

Status

Under construction and testing.

Responsible Agencies/Partners

Kentucky Transportation Cabinet, Federal Highway Administration, TransTech Electric, International Road Dynamics, and Highway Microsystems

Funding Arrangements

Total anticipated cost: $414,668

80% Federal Funds

20% State Funds

Physical Location

Natcher Parkway Interchange WB Exit ramp to the Owensboro Bypass

Technologies

The system uses four acoustical detectors to differentiate between trucks and cars. Once a truck is detected, a Model 170 controller calculates the speed of the vehicle. If the truck is exceeding a threshold speed, a fiber optic message sign is illuminated with, "TRUCKS REDUCE SPEED".

Future Applications

This first installation will serve as an evaluation of the concept and technology. Additional truck rollover warning systems may be deployed in various locations after the evaluation, possibly in conjunction with other detection technologies.

Weigh Station Networking

Project Description

All of Kentucky's weigh stations have been linked to a wide area network (WAN) to facilitate information sharing and accessibility of accurate and up-to-date data on the safety and credentials status of motor carriers, vehicles, and drivers.

Status

Operational.

Responsible Agencies/Partners

Kentucky Transportation Cabinet.

Funding Arrangements

Total cost: Approximately $180,000 ($10,000 per weigh station)

Operational Costs: Approximately $170/month per weigh station

Hubs and routers within weigh stations were funded through the Commercial Vehicle Information Systems and Networks (CVISN) program, which requires a 50/50 match. Operational costs are 100% state funds.

Physical Location

18 weigh stations throughout the state.

Technologies

There is an Ethernet local area network (LAN) within each weigh station. Each LAN is connected to a 56KB Frame Relay WAN. Each station also has access to the Internet via the WAN.

Future Applications

None noted.

5.0 DEVELOPMENT OF KENTUCKY'S ITS STRATEGIC PLAN

Kentucky's ITS Strategic Plan development began in early 1997, when representatives of the Kentucky Transportation Cabinet asked the Kentucky Transportation Center (KTC) to prepare a work plan outlining the proposed tasks for development of a Strategic Plan. A Study Advisory Committee was formed and met for the first time in May 1997. The proposed work plan was approved by the Transportation Cabinet on July 9, 1997. The approved work plan called for development of the Strategic Plan in two phases. The first phase focused on the areas of Advanced Traveler Information Systems (ATIS), Advanced Rural Transportation Systems (ARTS), and Commercial Vehicle Operations (CVO). The remaining areas of Advanced Traffic Management Systems (ATMS), Advanced Public Transportation Systems (APTS), and Advanced Vehicle Safety Systems (AVSS) were included in the second phase of the project.

The first step in the development of the Strategic Plan was a survey of other states regarding the status of ITS strategic plans. All 50 states were contacted in the fall of 1997. At that time, 11 states had completed strategic plans and 13 others were in the process of preparing such plans. Appendix A presents a summary of the responses received from the survey, including a summary of the strategic plan contents for 12 states. The primary reason for reviewing the work of other states was to evaluate the various approaches taken in development of their plans and to compare the essential contents of their reports. Specific items of interest included the time frame of the plan, whether mission and vision statements were included, whether there was a list of goals, whether there was reference or adherence to state or national architecture, and whether the plan was organized into functional areas or user services. Another feature noted was whether the strategic plan included a business plan for deployment or if a separate document was prepared as a business plan.

In October 1997, a focus group meeting was held, where approximately 30 stakeholders were requested to identify significant ITS issues in the areas of ATIS and ARTS. Those issues were then compiled by KTC staff and transmitted back to the participants with a request that they prioritize the issues for inclusion in the Strategic Plan. In December 1997, a meeting of state and local transportation planners was used as an additional focus group to solicit more information related to ITS issues. Results from both meetings were compiled and used as essential input for developing the Strategic Plan components for ATIS and ARTS. A summary of the information from the two focus group meetings is presented in Appendix B.

The development of a strategic plan for Commercial Vehicle Operations (CVO) originated from a different procedure than did the other functional areas of ITS. As Lead State in the Advantage I-75 Operational Test Project and a Model Deployment State for the Commercial Vehicle Information Systems and Networks (CVISN) program, Kentucky already had a well-developed CVO program, and was recognized as a national leader in this area. Thus, Kentucky had initiated strategic planning efforts related to CVO long before the ITS Strategic Plan Project began.

The strategic plan for CVO was developed out of the convergence of several parallel processes in Kentucky. As part of a statewide effort to redesign government processes,

"Empower Kentucky" work teams began meeting in early 1996 to develop improved and more efficient processes for CVO in Kentucky. Their conclusions and recommendations prefigured and encouraged the further activities of the Kentucky CVO working group that first convened in the summer of 1996. In an effort to conceptually organize the various CVO activities in Kentucky, and as a commitment to the CVISN Mainstreaming plan, an inclusive visioning exercise was held in early 1997. Out of that exercise emerged the six critical vision elements that guide this Strategic Plan. The vision, which demanded a broad base of input, drew on upper level administrators familiar with the broad array of projects in Kentucky.

The first phase of the ITS Strategic Plan Project culminated in the publication of the Phase 1 report in May 1998.

For the second phase of the project, another ITS focus group session was held in November 1999. This session brought together over 80 stakeholders from around the state. A morning session, with several presentations on ITS, was followed by afternoon breakout sessions, for which the participants were divided into groups on ATMS, APTS, and AVSS. Each focus group was tasked with identifying the attributes of the ideal system and the top issues and opportunities (for their respective focus area). The materials used for these sessions, along with the resulting summaries, are presented in Appendix C. The results from the focus groups were used to prepare a mission statement, vision statement, and list of goals for each area. These documents were then distributed to the participants for their review and comment. After all comments were received, the mission, vision, and goals were updated as necessary and incorporated into this final report.

6.0 COMPONENTS OF KENTUCKY'S ITS STRATEGIC PLAN

The following is a discussion of the mission, vision, and goals developed for each functional area of ITS: Advanced Rural Transportation Systems (ARTS), Advanced Traveler Information Systems (ATIS), Commercial Vehicle Operations (CVO), Advanced Traffic Management Systems (ATMS), Advanced Public Transportation Systems (APTS), and Advanced Vehicle Safety Systems (AVSS).

6.1 ADVANCED RURAL TRANSPORTATION SYSTEMS (ARTS)

6.1.1 Mission Statement

To enhance the quality and efficiency of transportation in rural Kentucky through the selective application of ITS technologies.

6.1.2 A Vision for Rural Transportation in 2020

Travel on Kentucky's rural highways has continued to improve as Intelligent Transportation Systems are implemented throughout the state. A strategy of applying technologies that can provide the greatest benefits for Kentucky has resulted in improved travel conditions and increased safety for rural travelers.

Travel information is available from dynamic message signs, highway advisory radio, interactive kiosks, and the Internet. Information about weather and road conditions is provided by Kentucky's Road Weather Information Systems (RWIS). Travelers are informed of incidents and construction activities, and guided around them with minimal delays. In-vehicle guidance systems can suggest alternate routes to escape congestion.

Many lives have been saved by improving emergency response in rural areas. Most vehicles are equipped with Mayday systems to notify emergency personnel and provide the location of an incident. The dispatching of police, fire, and emergency medical services is coordinated to provide the fastest possible response without being limited by jurisdictional boundaries. All emergency vehicles have automatic vehicle location equipment using Global Position System (GPS) technology, so that the nearest vehicle can be dispatched to the scene. The emergency vehicles also have guidance systems that determine the best route to the incident location. These systems save valuable minutes when lives are in danger.

Public transportation is much improved in rural areas. There is now a coordinated statewide transit network providing seamless public transit with convenient connections between service providers. All transit vehicles are equipped with GPS location devices, so that they can be tracked and routed by regional dispatching centers. Riders can call the dispatcher, and a bus is routed to pick them up within a reasonable time. The use of electronic payment systems makes payment for transit services much easier for both operators and passengers. The improvements in efficiency have made public transportation more convenient and affordable throughout Kentucky.

Kentucky has made significant improvements in the safety and efficiency of commercial vehicles. Both government and industry benefit from information technology that reduces paperwork and delay. Incentive programs and better targeting of enforcement activities have helped eliminate illegal and unsafe operations. Trucks carrying hazardous materials are monitored in a database which helps inform emergency personnel of the proper response to leaks or spills. Electronic pre-clearance of trucks has reduced congestion and conflicts near weigh/enforcement stations. Increased coordination with other modes of transport has helped to limit the growth of truck volumes on rural highways.

Advanced Vehicle Safety Systems are gaining acceptance in Kentucky. On-vehicle detectors are being used to sense the presence of children around school buses, as well as to provide collision warning and blind spot detection for cars and trucks. Vision enhancement systems are reducing visibility problems in darkness and inclement weather. These technologies are leading to safer highways in Kentucky.

Kentucky has seen dramatic changes in rural transportation. The use of ITS technologies has led to increases in safety, efficiency, and convenience which benefit both residents and tourists. The investment in new technology has made Kentucky a leader in rural transportation.

6.1.3 ARTS Goals

The following goals were established and prioritized for ARTS based on the transportation issues facing rural travelers in Kentucky.

I. Enhance statewide emergency response capability.

Response times can be lowered through increased coordination among agencies and through the application of Mayday systems, centralized dispatching, automatic vehicle location, and route guidance systems.

II. Improve connectivity between rural public transportation systems.

Transportation systems should be coordinated so that travelers can easily move from one to the other in a “seamless” statewide system. This will require easily available information about the routes and schedules of transit systems.

III. Implement efficient traffic management practices for incidents and construction activity.

A well-planned traffic management system would reduce the delays caused by incidents and construction. Detour routes would allow traffic to keep moving, and traveler information would alert travelers and allow opportunities to avoid the incident.

IV. Promote communication and information sharing among agencies.

Increasing communication among transportation agencies would lead to improvements in service and efficiency. Sharing knowledge and experience would benefit all agencies, and allow better service through increased coordination.

V. Improve signing and traveler information resources.

Enhanced signing and real-time traveler information would significantly improve travel in rural areas. Information about road and traffic conditions would improve efficiency, while information about attractions and services would help visitors and tourists.

VI. Develop Advanced Vehicle Safety Systems.

The development of new vehicle safety systems would increase safety on highways across Kentucky. Many technologies in this area need more time to develop, but some could provide immediate benefits.

6.2 ADVANCED TRAVELER INFORMATION SYSTEMS (ATIS)

6.2.1 Mission Statement

To improve the efficiency and safety of the transportation system by providing motorists with a variety of information, thus allowing them to make intelligent decisions concerning their route and mode of transportation.

6.2.2 A Vision for Traveler Information in 2020

Kentucky's transportation system has experienced some significant changes since the turn of the century. Perhaps the most noticeable changes have evolved due to the rapid growth in available information to motorists around the state. Information to aid in route choice, mode choice, and emergency response may be accessed en-route or prior to trips and is available to both tourists and residents.

With the creation of a statewide information network, including the integration of traffic management systems in Louisville, Lexington, and northern Kentucky, transportation data is provided to travelers throughout the state. Real-time traffic data is collected at a Statewide Traffic Operations Center and disseminated to motorists while en-route through highway infrastructure and in-vehicle communication technology. The network also provides drivers with specific guidance on detour routes.

Using the state's traffic Internet page, motorists may make route and mode choices before leaving for their destination. Interactive maps pinpoint trouble spots, estimate clearance times, and suggest detours. The region's comprehensive information network also utilizes other devices, including television, AM/FM radio, and a 24-hour telephone line to communicate traffic news to potential travelers.

Transit has become more convenient and simpler to use, providing an attractive alternative for some motorists. Real-time information about arrival and departure times may be obtained at transit stops or by using a computer at the home or office. Transit systems track their riders more closely through the use of electronic payment systems, allowing them to optimize their routes for better utilization.

To aid in emergency response, detailed reference markers have been added to all of Kentucky's Interstates and major rural highways. Emergency response vehicles equipped with automatic tracking technology allow dispatchers to know the exact location of all available units. All new cars are equipped with communication devices allowing both manual and automatic reporting of emergency situations. Improvements to roadway signs, emergency vehicles, and automobiles have reduced the response time to accidents and have resulted in saved lives in both urban and rural areas.

Kentucky has also enjoyed increased tourism revenues, as more tourists take advantage of the amenities and scenic countryside the state has to offer. Electronic pre-trip travel information

and new tourist-related signs are allowing the state's visitors to locate and enjoy Kentucky's many attractions. The state has also established electronic information booths at welcome centers, airports, transit stops, hotels, and even busy street corners. These information booths give specific travel directions and other information for hotels, restaurants, and tourist attractions around the state.

Tourists and residents have seen the benefits of having traveler information accessible to the public. The surge of information for travelers has given Kentucky one of the most efficient transportation systems in the country and made the state one of the most enjoyable places to live and visit.

6.2.3 ATIS Goals

The following goals were established and prioritized for ATIS based on the transportation issues facing motorists in Kentucky.

I. Reduce traffic congestion resulting from construction projects, roadway hazards, and adverse weather conditions by improving traveler awareness of these situations.

Congestion and construction management and the advanced warning of roadway events/conditions were considered the most critical issues in Kentucky concerning traveler information. By providing accurate and timely information, motorists can avoid these roadway situations.

II. Improve the response time and increase the availability of emergency services.

Officials in Kentucky would like to make improvements in the detection and management of incidents. Another issue is the minimal number of emergency response teams available. By using tracking technology, emergency response vehicles can be used more efficiently and respond more quickly to incidents, possibly reducing the severity of injuries.

III. Enhance traffic information and management services by integrating them on a regional basis.

Kentucky's current traffic management systems are a great strength for motorists in the areas covered by such systems. By integrating the Lexington, Louisville and northern Kentucky systems, travel can be simplified not only within those cities, but between cities as well. Areas in eastern and western Kentucky should also be included in such a system, to provide complete traffic information for all Kentuckians.

IV. Increase the attractiveness of public transit through the use of better transit information systems.

Another big issue facing Kentucky is the lack of efficient transit systems. Very few Kentuckians see public transit as a viable option to driving their automobile. Providing accurate and real-time information about the transit system will make it more attractive to the public. The increased use of transit may reduce traffic volumes and decrease congestion.

V. Increase tourism travel in Kentucky through better dissemination of information.

Many of Kentucky's tourist attractions are in remote settings. Without proper traveler information, some areas may not be easily accessed. By making this tourist information available, more people can enjoy the amenities the state has to offer. This will provide increased revenues for the state and its businesses.

VI. Improve driver performance through the use of traveler information systems.

With accurate traffic information available, motorists can avoid congestion and delays. This allows them to better concentrate on driving; thereby improving performance. This will lead to fewer accidents and less congestion.

6.3 COMMERCIAL VEHICLE OPERATIONS (CVO)

6.3.1 Mission Statement

To engage in the enforcement of motor carrier safety and regulatory laws in a manner that maximizes public safety while enhancing motor carrier efficiencies to promote commerce in Kentucky and the nation.

6.3.2 A Vision for Commercial Vehicle Operations in 2007

The processes of documenting and assuring the safe operation of commercial vehicles in Kentucky has shown dramatic improvement over the past several years. A streamlined process has been designed and installed, demonstrating Kentucky's ongoing leadership from that landmark success with Advantage CVO near the end of the 20th Century. Now, secure and accurate electronic information allows commercial vehicle operations to proceed without the burden of paper documents.

The new information technology systems enhance safety, efficiency, and productivity, thus providing numerous benefits to both government and industry. Unsafe and illegal operations have been effectively eliminated and an incentive-driven process of continuous performance improvement exists. Commercial vehicle operations also benefit from the many integrated improvements made as part of the North American Intelligent Transportation System initiative – especially the traveler information and hazard warning capabilities that have been fully deployed by Kentucky.

And most remarkably, this was done in an environment of cost-reduction for both government and industry. These systems, which now ensure greater over-the-road transportation productivity, have been built as a service to industry. No new taxes or surcharges were placed on the industry. Efficient technology goods and services have been developed by the private-sector largely because of the open systems and modular architecture standards that were championed by Kentucky in the national arena.

The success of Kentucky's approach has been attributed to its relentless pursuit of process improvement and enabling technologies—carriers and states working together to produce significant improvements for commercial vehicle operations supported by the research and development capabilities of industry and academia.

6.3.3 CVO Goals

Building on several team work sessions with a strong representation of the commercial vehicle operations community, the following set of long-term goals were established. They represent the specific problem areas to which subsequent programs and individual projects will be addressed.

I. Improve and streamline CVO

The first vision element enables Kentucky to pursue opportunities in establishing a systematic and uniform direction for CVO. Such improvements will make tax and other CVO application processes quicker and easier for both the applicant and the administrator. This vision element also provides the opportunity to use higher forms of technology in improving CVO. Streamlined CVO using higher forms of technology should help reduce roadside delays for commercial vehicle operators and enforcement personnel. It is anticipated that improved and streamlined CVO will strengthen Kentucky's image as a proactive, technologically advanced and customer-driven state.

Kentucky believes that improving and streamlining CVO are necessary in order to address increased commercial vehicle traffic on the Commonwealth's roadways. While better and more efficient CVO present Kentucky with the chance to improve its image, it should be noted that process reengineering will not compromise the State's highway safety mission.

II. Continuation of Kentucky's leadership role in CVO

By continuing its leadership role in CVO, Kentucky stands to enhance its image as a technologically advanced and customer-driven state. By focusing enforcement efforts on unsafe and non-compliant carriers, the state may create a more fair and equitable environment for commercial vehicle operations and help eliminate any industry perception that Kentucky is a regulatory "unfriendly" state. As a leader in CVO, Kentucky also has the opportunity to improve industry awareness of highway safety issues and motor carrier safety and economic regulations.

Through this leadership role, the Commonwealth also positions itself positively to address funding challenges. Kentucky believes its CVO leadership role will directly enhance its ability to conduct commercial vehicle enforcement in an effective and efficient manner, and continue to ensure full Federal compliance and enjoy Federal support.

III. Conduct paperless CVO operations with timely, current, accurate and verifiable electronic information, while maintaining security and privacy

As one of the primary opportunities of Kentucky's CVO initiative, the conduct of electronic CVO operations allows the State to use technology in higher capacity. This will help improve the current CVO application processes. Furthermore, the development of this "paperless" application environment will help ensure a systematic and uniform direction for CVO application processes. The electronic application processes will provide "real time" carrier economic, regulatory, and credentialing data which, coupled with timely carrier safety data, will assist enforcement personnel in targeting unsafe or illegal carriers on the Commonwealth's roadways.

Conducting paperless CVO that emphasizes timely, current, accurate and verifiable electronic information is attractive because it will allow administrators to effectively and efficiently process the ever-increasing volume of carriers moving through Kentucky. The data gathered will help the Transportation Cabinet collect additional tax revenues and help reduce damage to the Commonwealth's highway infrastructure.

IV. Enhance CVO productivity, safety, and efficiency by eliminating unsafe and illegal operations and providing incentives for improved performance

Kentucky envisions an operational environment that emphasizes the detecting of motor carriers found operating in an unsafe and/or illegal manner. Conversely, safe carriers will see the amount of time spent in weigh station queues and inspection facilities reduced, thus saving the carrier money. By reducing the number of unsafe and/or illegal carriers, the Commonwealth will reduce truck-related crash costs and infrastructure damage.

It is anticipated that these process refinements will address the opportunities to use technology in a higher capacity to target high-risk carriers, while also improving industry awareness of highway safety issues and motor carrier safety regulations. Furthermore, by enhancing CVO productivity, safety, and efficiency, Kentucky stands to enhance its image as a customer-oriented, safety-based state. Similarly, this will also promote just-in-time logistics, which is critical for attracting high-value manufacturing jobs. This may provide a climate suitable to increasing the state's motor carrier base.

V. Integrate and coordinate ITS operations and Empower Kentucky

Empower Kentucky has produced the changed environment supportive of CVO deployment. Uniform system direction relies on coordination and a thorough integration of processes in order to fully realize a paperless environment, thus speeding up the slow application process. Targeting high-risk carriers demands that accurate and timely information, from a variety of sources, be shared in a coordinated manner, so that safety is not compromised. The higher use of technology can emerge in an environment where all parties understand its role and usefulness. Successful implementations encourage all segments of the enforcement community to act in concert to reward safe carriers. Such implementations will improve the external image of Kentucky such that it will not be considered unfriendly by carriers.

Having a coherent plan for the implementation of improvements avoids complicated and competing funding issues for complementary ITS initiatives, and each implementation leverages the resources invested in all other implementations. External grant applications are easier to generate when the overall logic and role of each component is fully understood and rationalized. The Empower Kentucky charge to avoid lost taxes makes Intelligent Transportation Systems truly "intelligent", and focuses deployment on the need to lower crash costs and infrastructure damage.

VI. Create a CVO system that is self-sufficient, uses multiple vendors, and is user friendly

This goal is important for the long-term health of Kentucky's CVO community. To maintain a uniform system direction, Kentucky must be able to control and modify its processes and the accompanying technologies at will. By being able to draw on multiple vendors in addition to its own expertise, Kentucky can choose processes that optimize user friendliness, improving its image with the carrier base. This should increase carrier participation in electronic credentialing and screening programs, thus reducing the demand on redundant legacy systems. Increased participation in these streamlined processes will minimize administrative turnaround time and roadside delays for carriers. Kentucky can reduce costs by having options for each process, thus relieving some of the funding issues associated with new projects.

6.4 ADVANCED TRAFFIC MANAGEMENT SYSTEMS

6.4.1 Mission Statement

To improve the overall safety and efficiency of the transportation system by using advanced traffic management technologies to collect traffic data, monitor traffic flow, and disseminate this information to the traveling public and traffic control centers.

6.4.2 A Vision for Traffic Management in 2020

Advanced Traffic Management Systems have developed a great deal since they were first introduced to Kentucky. The systems collect traffic data, monitor traffic flow, and disseminate this information to the users of the surface transportation network more efficiently than in previous years.

Real-time traffic information regarding road conditions due to adverse weather, construction activities, incidents, or other congestion delays is disseminated through dynamic message signs, highway advisory radio systems, Internet sites, in-vehicle navigation/information devices, kiosks, and telephone advisory systems. Traffic signals are coordinated and responsive to volume changes and incidents. Congestion is reduced by more commuters using electronic payment options at tollbooths and parking garages. Intersections are safer due to photo enforcement systems being used for red light violators. Trucks transporting hazardous materials are tracked as they move throughout the state in order to respond to hazardous material incidents more quickly.

Alternate methods of travel are more popular than in previous years. More travelers are using the expanded and more efficient mass transit systems, such as buses and light rail trains, in urban areas. High Occupancy Vehicle (HOV) lanes in the urbanized areas are encouraging more commuters to carpool. Bikers are also taking advantage of a well-established system of bike lanes throughout the state. With the expanded use of alternate modes of travel, pollution related to automobiles has decreased; however, dynamic message signs are available, if needed, for notification of ozone action days.

Highway rail intersections are becoming safer with advanced technologies. The use of quadrant gates seals the crossing, thus preventing drivers from proceeding around the gates. This reduces the number of incidents and the need to sound train horns in residential areas. Detectors, in addition to quadrant gates, are used to alert the train operators when stalled or trapped vehicles are on the tracks, which allows the operators sufficient time to slow or stop the train. Many delivery drivers, bus drivers, and commuters that cross railroad tracks regularly are using in-vehicle dashboard warning devices to alert them of oncoming trains. Photo enforcement for violators going around the gates is being used at busy crossings in order to increase awareness of the danger involved, thus reducing the number of incidents. Rail safety classes are encouraged as a way to educate the public of the possible dangers at highway rail crossings.

Incident management is a major area of focus for traffic control centers. Surveillance technologies are used to monitor traffic flow and detect incidents. There are direct lines of communication with emergency response teams when an incident occurs. Major accidents are cleaned up quickly, reducing congestion for travelers. Variable speed limit signs are common on Interstates and throughout the roadway system to adjust traffic during times of construction and maintenance work or incidents. Detour or alternate route information is disseminated through the Statewide Traffic Operations Center when incidents occur. Sensors are networked throughout the state to inform travelers of adverse weather conditions in an effort to prevent incidents.

Automatic vehicle location (AVL) is used for emergency vehicles to enable quicker response times to incidents. AVL enables dispatchers in emergency control centers to know the location of emergency response vehicles and to route them around possible delays or blockages such as traffic congestion or rail crossings. Signal prioritization or preemption is used to improve the response time of emergency vehicles to the scene of the incident, while also reducing the likelihood of traffic accidents at intersections while en-route to the incident.

All technologies are integrated and provide data to the Statewide Traffic Operations Center for dissemination. There is a statewide team of stakeholders to review new technologies and suggest possible problems, solutions, and/or locations for implementing those technologies. The ATMS in Kentucky has produced a positive experience for travelers on the state surface transportation network.

6.4.3 ATMS Goals

The following goals were established and prioritized for ATMS based on the transportation issues facing motorists in Kentucky.

I. Develop a statewide ITS plan and an ITS architecture that identifies the needs, goals, and plans for Kentucky.

A statewide blueprint and architecture will allow a detailed plan with long- and short-range goals for traffic management statewide. The best and most successful practices currently being used, along with new technologies, will be incorporated into the blueprint detailing the most critical areas in need of ATMS.

II. Identify and allocate available funding for ITS projects.

Private and public entities will need to identify mutually beneficial projects for cost sharing purposes. There will be ongoing research in order to implement the latest available technologies to achieve the greatest benefits with the most cost-effective methods.

III. Resolve issues regarding public policies and laws.

Legislative changes will be required before several ATMS applications can be used. Changing laws and policies will enable emission testing applications, photo enforcement applications, and faster incident management applications to be enacted.

IV. Develop a Statewide Traffic Operations Center for collection and dissemination of traffic information.

Information on weather/road conditions, construction, and incidents will be located in one centralized location. This will allow the different agencies around the state to report their information to one place and have it coordinated with the other agencies through one report, thus minimizing duplication of efforts. This will reduce the need for travelers to search through several sources for the desired information when traveling across the state.

V. Integrate and coordinate incident management response.

Integration and coordination of incident response personnel throughout the state can improve with greater communication and interaction among the different agencies, such as police, fire/emergency dispatchers, and traffic personnel. All Interstate routes will have marked detour routes, and the traffic control centers will disseminate the appropriate detour information to the traveling public when needed. The result will be prompt identification of the incident, improved dispatch of personnel to address the incident, more efficient use of resources for traffic control, and a reduction in the overall congestion/delay associated with incidents.

VI. Provide ITS training and education.

Training and education on the new technologies and the benefits of traffic management systems are the key to increased awareness and acceptance of ITS systems. One way to teach the community about ITS is to encourage the users of the transportation system to attend public meetings and forums to see the possible benefits of future ITS projects.

VII. Improve safety at highway rail crossings.

Priority must be given to decreasing the number of highway rail crossing incidents. A rail safety team should be developed, involving public and private entities, to create the partnerships necessary to identify, prioritize, and implement rail crossing safety measures.

6.5 ADVANCED PUBLIC TRANSPORTATION SYSTEMS (APTS)

6.5.1 Mission Statement

To improve the flow of traffic and reduce congestion by decreasing reliance on the personal automobile through more efficient, convenient, and safe public transportation systems.

6.5.2 A Vision for Public Transit in 2020

Enhancements to public transportation systems in Kentucky have made transit more convenient and easy to use. These systems operate more efficiently and effectively, getting passengers to their destinations quickly and on-time. As a result, transit usage has increased significantly, and traffic congestion has been reduced.

With vehicle tracking systems, the precise locations of transit vehicles are known at all times. As customers request service, computer-aided dispatching systems schedule, dispatch, and route the appropriate vehicle. Transit providers disseminate up-to-date information to the public and also direct emergency services to the vehicle when necessary. A comprehensive statewide mapping system enables transit providers to coordinate with one another, providing seamless services to all areas of Kentucky.

Transit providers are able to operate efficiently and effectively by collecting information on their fleets and passengers. On-board maintenance systems keep operators informed of the mechanical condition of the vehicles, thus allowing them to identify problems quickly and schedule maintenance as needed. Automated systems count the number of passengers on the vehicle at designated locations, and electronic payment cards allow providers to learn about their customers. These passenger information systems have appropriate safeguards to protect the privacy of transit customers.

The “cashless” fare system being used statewide has made transit increasingly convenient and safe for providers, passengers, and operators of transit vehicles. Mandatory safety standards, supplemented by surveillance equipment and alarms, have helped to create a safe environment in the transit community.

Up-to-date transit information is provided to the public prior to their trips and while en-route. Such information is available at home, in the office, at transfer stations, on-board transit vehicles, and at other public locations. Transit providers also share information with the Statewide Traffic Operations Center. Information concerning traffic congestion, incidents, and construction is used by providers to automatically reroute transit vehicles to minimize travel time.

Improvements to Kentucky’s statewide transit system have decreased reliance on the personal automobile. Travelers utilize a variety of transportation modes, thus improving mobility for everyone.

6.5.3 APTS Goals

The following goals were established and prioritized for APTS based on the transportation issues and opportunities facing travelers in Kentucky.

I. Increase funding opportunities for public transit systems.

Funding for improvements to transit systems is the number one issue facing transit providers throughout the state. By planning on a statewide level and utilizing federal initiatives, transit systems will have more funding to make the necessary improvements.

II. Increase the efficiency and convenience of transit services by developing a statewide coordinated transit system.

Coordination among transit systems on a statewide level is considered a critical opportunity that must be embraced. With open communications and compatible technology, transit providers can provide a flexible system to a greater number of people.

III. Improve the level and quality of service of transit systems to make them a convenient, attractive alternative to the personal automobile.

In the past, the image of transit systems has been tarnished by inefficient and inconvenient service. Improvements in the level and quality of service provided will make transit a more attractive alternative to the personal automobile.

IV. Improve safety for transit operators and passengers while on-board transit vehicles and at boarding and transfer stations.

Safety and security are always key issues for transit operators and passengers. By enforcing safety standards among providers and using technology to supplement these standards, operators and passengers will feel secure while using public transit.

V. Increase public awareness and improve customer service by making transit information available to the public prior to and during their trip.

Once transit's quality of service is improved, passengers and potential passengers must be made aware of these improvements. By disseminating up-to-date information prior to a trip, the public can make intelligent decisions about their mode of transportation. Providing up-to-date arrival and departure information to passengers during their trip is an added convenience to the customers.

6.6 ADVANCED VEHICLE SAFETY SYSTEMS

6.6.1 Mission Statement

To improve the safety, comfort, and efficiency of travel on Kentucky's roadways through intelligent applications of vehicle-based systems that assist in the driving task, reduce the likelihood of a collision, and provide enhanced protection for vehicle occupants.

6.6.2 A Vision for Vehicle Safety Systems in 2020

There has been substantial proliferation of vehicle-based technologies to assist in the driving task. Collision avoidance systems using onboard radar are widely deployed and are now standard equipment on new vehicles. As a result of the warnings provided by these systems, there have been substantial reductions in the number of rear-end collisions and the number of side-to-side collisions associated with lane changes. When collisions do occur, advanced passenger restraint systems reduce the severity of injuries sustained in those collisions.

Technologies have been deployed to enhance vision, particularly in conditions of restricted visibility. Other technologies detect driver impairment (due to age, drowsiness, alcohol, drugs, etc.) and provide appropriate warnings or disable the vehicle, as appropriate. In addition, onboard sensors detect lane departure and alert the driver that the vehicle is veering out of its lane.

As these technologies have been developed, there has been heavy emphasis on making them reliable and fail-safe. This cooperative emphasis by vehicle manufacturers, technology suppliers, and public agencies has resulted in highly safe systems, and the fail-safe designs have avoided situations where drivers are dependent on technology and fail to receive a needed indication. Emphasis has also been placed on implementing technologies so they do not interfere with the primary driving task. Systems have been designed and user interfaces have been developed with a focus on simplicity and integration, so there is minimal distraction of the driver from the driving task.

While a fully automated highway has yet to be implemented in Kentucky, longitudinal control of vehicles is commonplace, with widespread deployment of adaptive cruise control systems. These systems have contributed to safer headways (i.e., less tailgating), smoother traffic flow, and fewer collisions. Electronic braking systems (replacing more traditional anti-lock brakes) have been widely deployed on commercial vehicles, thus substantially reducing the distance required for those vehicles to stop. There has also been some initial deployment (on a limited basis) of collision avoidance systems with automated braking capability. The performance of those systems is being observed and evaluated.

As on-vehicle technologies have matured and deployment has widened, costs for such technologies have decreased to where they are affordable for the majority of new car buyers.

6.6.3 AVSS Goals

The following goals were established and prioritized for AVSS based on the transportation issues facing travelers in Kentucky.

I. Establish appropriate standards and specifications to ensure compatibility, interoperability, and conformance to minimum requirements for all systems.

It is a legitimate role for the public sector to establish necessary standards and specifications for the deployment of AVSS. Without such standards and specifications, multiple systems could be deployed in a non-integrated, non-compatible fashion.

It is also legitimate for public agencies to set minimum performance standards for any system that potentially affects vehicle safety.

II. Educate drivers on proper use of Advanced Vehicle Safety Systems.

Deployment of on-vehicle systems will change the driving task, creating new sources of information for the driver and new human-machine interfaces. While strong emphasis will be given to making these interfaces user-friendly and non-distracting, it will also be necessary to educate drivers on the proper use of these systems. Without such education, drivers could potentially misinterpret the information provided, be distracted from the driving task, or become overly reliant on the technology.

III. Determine the appropriate cost responsibility (public versus private sector) for deployment of Advanced Vehicle Safety Systems.

The bulk of AVSS technology consists of vehicle-based systems and will be deployed by vehicle manufacturers and technology suppliers. However, some systems require infrastructure elements as well, and all systems require some public involvement in testing, standardization, and integration. It will be necessary to determine the appropriate cost-sharing relationship for this cooperative public-private effort.

IV. Provide adequate funding for research.

Because of the enormous safety implications of AVSS technologies, they must not be implemented carelessly. It is vital that sufficient funding be provided for research to ensure that these systems are properly understood and tested before implementation, that they are implemented in an integrated fashion, and that they are fully evaluated once they have been implemented.

V. Reduce crashes.

Obviously, a primary goal of implementing AVSS technologies is to reduce vehicle collisions.

VI. Regulate use of potentially distracting technologies while driving.

When new technologies are implemented in the vehicle, they create the potential for distracting the driver from the driving task. This is a concern with current technologies (such as cellular phones), and will become even more of a concern as additional technologies are deployed. Appropriate standards, specifications, and regulations should be enacted to minimize the potential for creating distractions for the driver.

VII. Determine how best to resolve the older driver issue.

With regard to older drivers, technology can potentially be used to enhance their abilities and allow them to keep their driving privileges for a longer time. However, it can be argued that we should not be trying to keep drivers behind the wheel if those drivers have impaired abilities. Onboard technologies could be used not only to compensate for certain impairments of older drivers, but also to detect impairments that cannot be compensated for with technology (and to provide appropriate warnings of such impairments).

There is not currently a clear consensus of the best use of technology for older drivers. This is an area deserving further research and exploration.

VIII. Start planning at the state level now.

Kentucky needs to recognize that Advanced Vehicle Safety Systems are coming and start planning for them now. Early planning can generate substantial dividends in ensuring that systems are deployed so as to achieve the desired goals.

7.0 ITS PUBLIC RELATIONS/MARKETING

7.1 INTRODUCTION TO ITS MARKETING

Because ITS is a new concept, traditional transportation approaches may not be sufficient to guarantee successful implementation. Several factors stand opposed to ITS; these include the innate human resistance to change, the fear of the unknown, a natural aversion to risk-taking, and the high comfort level associated with more traditional methods and approaches. Implementing ITS technologies in the face of these potential obstacles requires that we give attention not only to the technical aspects of ITS, but also to public relations, marketing, and education. The national organizations promoting ITS have recognized this need and have developed numerous marketing tools to disseminate information on ITS projects and evolving technologies. Program development for ITS has received nearly unprecedented attention and funding support from leadership positions in Federal agencies. In response, many consultants, contractors, and state agencies have embraced the ITS concept.

7.2 TARGET AUDIENCES FOR ITS MARKETING

When marketing ITS, there are at least three target audiences, and the marketing objectives will vary for each audience. One target group can be called "decision-makers." These are the people who hold the purse strings; who determine how funding will be allocated; who establish organizational goals and priorities. The primary purpose of marketing ITS to this group is to ensure adequate funding and priority for the ITS program. In most cases, ITS must compete for its share of the available funding, so if decision-makers are unaware of the capabilities and benefits of ITS, then funding may be directed elsewhere. Thus, when marketing to this group, emphasis should be given to the value of ITS, the specific benefits to be gained, the funding required, and the anticipated return on investment. Whenever possible, such marketing should emphasize real-world examples, thus helping decision-makers to see ITS as real and practical, rather than as "vapor-ware."

A second target group for ITS marketing consists of the end users, or the "traveling public." One reason for marketing ITS to this group is to generate public support for ITS investment, which can then assist in influencing the decision-makers group (as discussed previously). However, marketing to the traveling public has a second purpose, which is to educate users on the types of technologies being deployed and how they can realize the maximum benefits from those technologies. For example, when a traveler information system is deployed, it is essential that users find out the type of information that is available and how to access it. If such information does not get to the users, then the effectiveness of the system is compromised, the anticipated benefits of the system are not realized, and the value of the investment (both real and perceived) is lessened.

Educating users on how to use a particular system may provide significant safety benefits. Many ITS systems provide additional information to the driver, and that information can prove extremely useful in avoiding unsafe situations. However, additional information can also distract the driver from the primary driving task. Knowing how to access and interpret the available

information, without diverting attention from the driving task, is essential for safe and efficient operation.

For some systems, the user must have a certain level of knowledge in order to properly interact with the system. Without such knowledge, the performance of the system can be greatly compromised. A simple example is actuated traffic signals. Such signals can provide extreme efficiency gains, but their efficiency is sometimes compromised by drivers who don't realize how they work. Specifically, many drivers will pull their vehicle past the stop bar, where it is not sensed by the detector, and then wonder why the light won't turn green.

Some ITS technologies are implemented for enforcement purposes. For these applications, the intent of the system is not just to catch violators, but to promote high levels of compliance. Through effective marketing and education, users can be informed of the capabilities of the enforcement system and the consequences of violating the law. Such education promotes high levels of compliance.

The final target group for ITS marketing and public relations is the "implementers and operators." These are the people, within public agencies and private sector companies, who actually get the systems implemented and who operate and maintain them once they are in place. Marketing to this group has several purposes. One objective is to enable them to better perform their duties. Obviously, the more they know about the technologies being implemented, the better job they can do of implementing, operating, and maintaining them properly.

A second reason for marketing to the implementors and operators is to leverage their creativity and their expertise. These are the people who, when made aware of a particular technology, are best equipped to identify a specific need that the technology could fill. This can generate new and innovative applications of proven and developing technologies.

The implementors and operators can also be powerful spokespersons for ITS in their homes and communities. When these people are informed and enthusiastic about ITS, they can initiate a great deal of word-of-mouth marketing through their daily contact with the general public.

The most effective marketing campaign will be one that is tailored to each of the target audiences. Each audience will have different information needs, and the best medium for reaching one group may not be the best for every group. Thus, it is recommended that the Transportation Cabinet develop a comprehensive marketing strategy that addresses the needs and unique characteristics of each group.

7.3 MARKETING STRATEGIES AND TECHNIQUES

There are numerous ways to market ITS, and there is no single way that is best in all circumstances. The intent of this report is not to suggest a specific marketing strategy, but to provide some examples of available techniques. The strategy pursued by the Transportation Cabinet should most likely be a combination of these and others.

One of the best ways to market ITS is to publicize "early winners," projects that have become early success stories in the ITS field. Kentucky has shared in the early success of ITS and has become recognized as a national leader. As a result, there are numerous success stories within the Commonwealth. There are also many success stories from other states that can be used for our marketing purposes. Publicizing these early winners can take various forms. Some projects have produced videos, others have generated web pages, still others have created interactive CD-ROMs. Presentations, brochures, media events, cable access programs, and other mechanisms can also be used to publicize successful projects.

Not all marketing materials are built around specific projects. Many excellent resources have been prepared, in Kentucky and elsewhere, to promote the capabilities and potential of ITS technologies and to educate the audience regarding ITS technologies, relationships, and terminology. These resources include videos, presentations, reports, brochures, web pages, CD-ROMs, and other media.

Of course, producing marketing materials is only half the battle. Even the best materials are worthless if they are never viewed by the target audience. Therefore, an effective marketing plan must include strategies for getting the material to the audience. Since ITS marketing targets more than one audience, there will be different strategies for each audience. For example, one or more of the following techniques might be used for disseminating information to the traveling public: links from popular web sites; media events; advertising spots on television and radio; an "ITS Speakers' Bureau" available for local clubs, civic groups, and other organizations; and educational materials distributed to primary, secondary, and post-secondary schools. Numerous other examples could be listed.

7.4 STAKEHOLDER INVOLVEMENT

The purpose of ITS marketing is not always to disseminate information. Sometimes, it is to gather information from stakeholders to assist in formulating plans and strategies. Such was the case with the focus group sessions for the Strategic Plan development. Those sessions were extremely beneficial in developing a Strategic Plan that reflected the views and priorities of a wide variety of stakeholders throughout Kentucky. It would be wise to routinely seek the input of stakeholders, perhaps in conjunction with a periodic update of the Strategic Plan and the Business Plan. A series of ITS Forums, either in a central location or distributed throughout the state, could provide a valuable tool in periodically evaluating Kentucky's ITS program, fostering innovative thinking, and promoting information sharing.

7.5 ROLES AND RESPONSIBILITIES

A final consideration in developing a marketing strategy for ITS is to determine how to best allocate responsibilities for carrying out the marketing program. The Transportation Cabinet does not have a designated "ITS Marketing" staff. Thus, undertaking a significant ITS marketing effort will require decisions on how that effort will be supported. The option of using outside resources versus Cabinet personnel will need to be evaluated. Workload requirements will need to be assessed against available staffing, and decisions will need to be made accordingly. These

decisions may have implications for the ITS organizational structure of the Transportation Cabinet, which is discussed in Section 8.0 of this report.

Whatever specific decisions are made regarding marketing strategies, the crucial point is that marketing must not be an afterthought. It is a vital component of Kentucky's ITS program, and the success of the overall program depends heavily on the effectiveness of the marketing emphasis.

8.0 ITS OPERATIONS AND MAINTENANCE

To date, much of the emphasis regarding ITS within the Federal Government and state agencies has been focused on developing and deploying systems. In most cases, very little emphasis has been given to proper operation and maintenance (O&M) of those systems once they are deployed. ITS technologies present some significant O&M challenges to traditional transportation agencies. Some specific challenges are listed here:

- Operating advanced systems requires a high level of integration among existing systems and agencies.
- Deployment of new systems places an additional burden on existing operations and maintenance personnel, who already have responsibilities and may already be overloaded. These personnel must then deal with conflicting priorities.
- When new systems are deployed, it is not always clear who is to have responsibility for operating and maintaining them.
- Operating advanced systems requires new skills and capabilities, which may not exist in a traditional transportation agency. This creates a need to train existing personnel and/or add new personnel.
- Maintaining ITS technologies requires a high degree of technical proficiency, with specialized skills and expertise. Again, this necessitates training of existing personnel and/or hiring new personnel.
- Deployment of non-standard devices and systems can create an operations and maintenance headache, with non-standard interfaces, additional training requirements, and excessive spare parts requirements.

With these challenges in mind, it is important that every new ITS project include full consideration of how the system will be operated and maintained. This would include a clear assignment of responsibility, delineation of training requirements, selection of a maintenance approach (in-house, contract, etc.), and any standardization requirements. These considerations should be brought in at the earliest stages of planning the project, and should continue to be included throughout all stages of the project development.

In addition to including O&M considerations in project planning and development, the Transportation Cabinet should develop an ITS Maintenance Plan. This plan would be developed with heavy stakeholder involvement, and would lay out the Cabinet's strategy for effectively and efficiently maintaining all of its ITS deployments. At least one other state (Oregon) has developed an ITS Maintenance Plan, and several metropolitan areas have developed maintenance models. The work of these agencies could be used as a model or a starting point for the Kentucky plan.

9.0 ITS ORGANIZATIONAL STRUCTURE

Determining the best organizational structure for ITS requires an understanding of the administrative context, the mission of the organization, the resources available (e.g., funds, expertise, time), and the management/leadership commitment. Within a given organization, these issues will depend heavily on the perceived short-term and long-term benefits of ITS.

9.1 Purpose and Principles

Any organizational structure is meant to bring human resources to bear upon a mission. The primary challenge is to have the right human resources in the right relationship. The purpose of this discussion is to identify the characteristics of the best organizational structure, i.e., one that maximizes resources in pursuit of the Kentucky ITS mission/vision. The driving principles should include: simplicity (of components and process); team-based methods (bringing to bear the right human resources in a consensus-building environment); skilled communication (with maximum use of appropriate information technology); accountability (milestone guidance toward mission/vision); and learning (knowing its best practices and past mistakes).

9.2 Resources and Mission/Vision

Other sections of this plan spell out the strategic direction and the goals of Kentucky's ITS development. It is clear that efficient ITS development and deployment requires knowledge in five basic areas: 1) user needs and application environment; 2) appropriate ITS technologies (sensing, control, and display); 3) information technology (communication and computer processing); 4) systems integration/engineering; and 5) systems operations (training, maintenance, etc.). Studies of product development in the automotive industry have shown that the closer you bring the diverse knowledge areas together, working toward an accepted mission, the more effective and efficient is the product. This relationship should also hold true for ITS development and deployment.

9.3 Organizational Considerations

The options for organizational structure range from the existing structures, which are somewhat disjointed and complex, to a more unified, focused structure of roles and responsibilities. It should be mentioned that the so-called ITS technologies, while currently packaged to be unique, are simply new ways of doing things that are aimed at improving safety and efficiency. These new ways are information-technology-based, but must be integrated into old highways and old processes. As they become integrated, the lines will blur and these technologies will become just part of doing business in the 21st century. But, for now, ITS requires new expertise for users and some kind of designated support staff. We will have more information technologists on the team, and we will have to learn more about using these technologies on a regular basis. If there is a desire to significantly accelerate the development and deployment of ITS technology, then a coordinated, task-focused staff and adequate technical support capability is warranted in the near-term. In 1999, the Transportation Cabinet took its

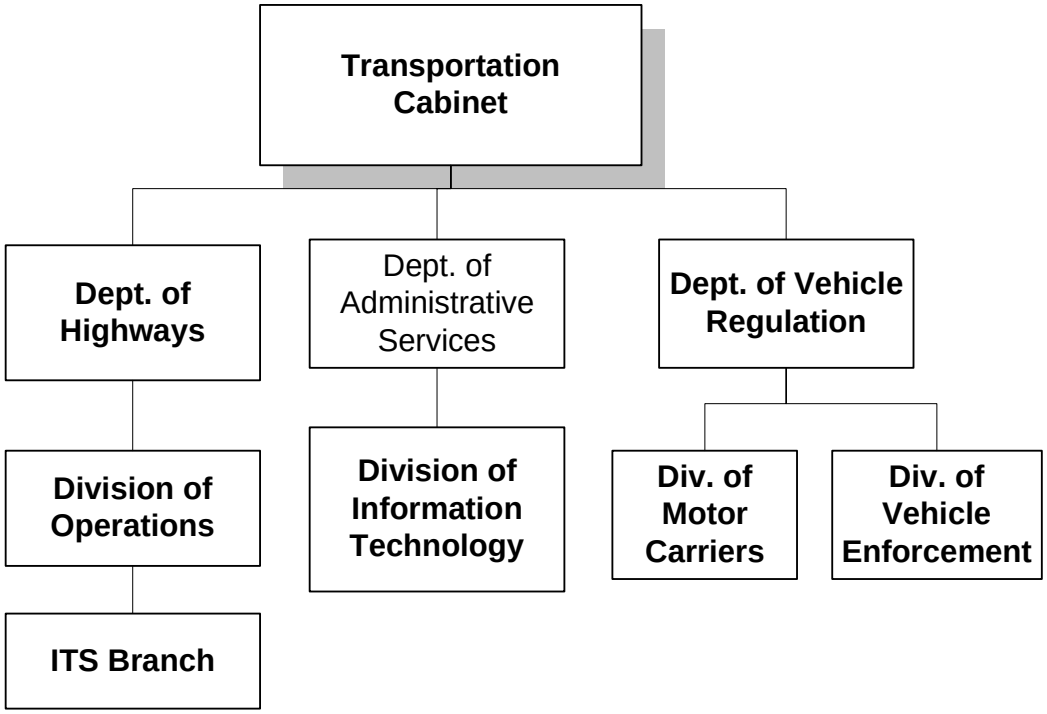
first step toward creating a designated ITS staff, with the creation of the ITS Branch within the Department of Highways' Division of Operations.

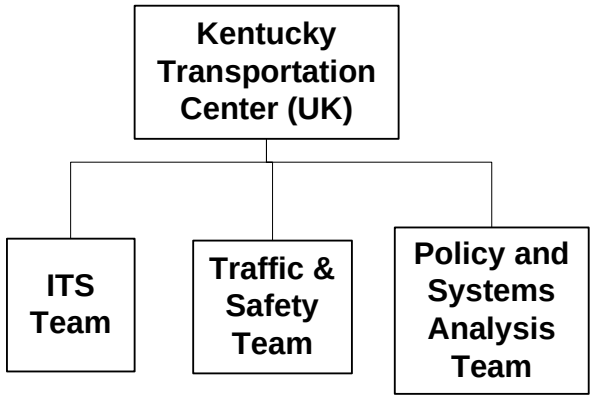
The ITS organizational structure and working relationships charts on the following two pages show clearly the diversity and complexity that has grown as partnerships and teams have been formed around various ITS projects. In the ITS Organization chart, the entities shown in bold print are those with significant, direct involvement in Kentucky's ITS program. In the ITS Working Relationships chart, the projects depicted are those for which formal (or at least semi-formal) partnerships have been formed, and they are described in Section 4.0 of this plan.

Within the Kentucky Transportation Cabinet, two departments (Highways and Vehicle Regulation) have been significantly involved in ITS, which brings several departmental divisions into play. In addition, the Division of Information Technology (part of the Department of Administration within the Transportation Cabinet) provides ongoing support for most of the CVO (Commercial Vehicle Operations) projects. Each project shown is unique in terms of involved jurisdictions and designated 'staff' teams that include: committees, groups, task forces, and Transportation Cabinet Divisions. This illustrates the unusual amount of diversity of institutional jurisdictions and bureaucratic structures that contribute to the uniqueness of ITS projects.

ITS Organization in Kentucky

April 2000





ITS Working Relationships in Kentucky

April 2000

ITS Strategic Plan: Study Advisory Committee

--ITS Branch
--Div. of Traffic
--Div. of Planning
--Multimodal Programs
--DIV. of ROW & Utilities
--Div. of Construction
--State Hwy Engr's Office
--District Offices
--Dept. of Vehicle Reg.
--FHWA
--TARC
--KY State Police
--Lexington-Fayette UCG
--KTC (UK)

TRIMARC Task Force

--KYTC
--Indiana DOT
--Louisville MPO
--FHWA
--KTC (UK)
--TRW, Inc.
--HNTB
--Sparton Constr. Co.
--Bluegrass Electric

ARTIMIS Regional Incident Mgmt. Task Force

--KYTC
--Ohio DOT
--MPO (OKI)
--FHWA
--City of Cincinnati
--TRW, Inc.
--Pflum, Klausmeier & Gehrum
--Proudfoot Assoc.
--Samaritania
--Smartroute Systems
--TEC Engineering
--JHK & Assoc.
--Alcatel NA
--W.G. Fairfield
--Spartan Constr. Co.
--C.R.&R., Inc.

CVISN Deployment Task Force

--Dept. of Veh. Reg.
--Div. of Motor Carriers
--Div. of Vehicle Enf.
--KTC (UK)
--IDT
--TRW, Inc.
--Transfomation Systems

ITS/CVO Working Group

--KYTC
--KMTA
--Lexington Cartage
--FHWA

NORPASS Partnership

--Kentucky
--Florida
--Georgia
--Idaho
--North Carolina
--Utah
--Washington
--TransCore, Inc.

Cumberland Gap Tunnel

--KYTC
--National Park Service
--FHWA
--Tennessee DOT
--Vaughn & Melton
--Parsons Brinckerhoff, Quade & Douglas
--Walsh Construction
--Archer-Western Contractors
--C.G. Tunnel Authority
--Other subs/vendors

10.0 APPENDICES

Appendix A. Summary of Results From Survey of ITS Activities in Other States

Appendix B. Summary of Focus Group Meetings of October-December 1998 (ARTS and ATIS)

Appendix C. Summary of Focus Group Meetings of November 1999 (ATMS, APTS, and AVSS)

10.1 APPENDIX A

SUMMARY OF SURVEY OF ITS ACTIVITIES IN OTHER STATES

Survey of ITS Strategic Plan Status
(Conducted: Autumn 1997)

STATE	STATEWIDE PLAN COMPLETE	IN PROGRESS	COMMENTS
Alabama	No		Let urban areas act/plan independently
Alaska	No		Have a rural scoping study concentrated on CVO
Arizona	No	Yes	Have rural corridor study, infrastructure study, two urban plans.
Arkansas	No		Are not currently using ITS
California	Yes		Have both a plan and an update
Colorado	Yes	Yes	Working on new version
Connecticut	No		Working on two urban plans
Delaware	No	Yes	
Florida	No	Yes	
Georgia	No	Yes	
Hawaii	No		Use very little ITS
Idaho	No		Use very little ITS
Illinois	No		Have draft of urban plan and ITS fact sheets
Indiana	No	Yes	
Iowa	No	Yes	
Kansas	No		Working on urban plans
Kentucky	No	Yes	
Louisiana	No	Yes	
Maine	No		Starting urban plan for Portland
Maryland	Yes		Have separate document to describe projects
Massachusetts	No		Have plans for urban areas
Michigan	Yes		
Minnesota	Yes		Also have shorter executive report and rural scoping study
Mississippi	No		Do not see a need for one
Missouri	No		Have urban plans
Montana	No	Yes	
Nebraska	No	Yes	
New Hampshire	No		Using very little ITS
New Jersey	Yes	Yes	Working on new, better plan to replace current unapproved plan
New Mexico	No		Considering starting a plan

New York	No		Have brief ITS statement
North Carolina	No		Have urban plans
North Dakota	No		Use some ITS technology
Ohio	No		Have six urban plans and a rural corridor study
Oklahoma	No		Working on urban plan for Oklahoma City
Oregon	No	Yes	
Pennsylvania	Yes		Also have paper about planning process
Rhode Island	No	Yes	Have preliminary draft
South Carolina	No		Starting with urban areas
South Dakota	No		Working with CVO only
Tennessee	No	Yes	Just completed a progress report
Texas	Yes		
Utah	No		Have urban plan for Salt Lake City
Vermont	No		ITS included in overall transportation plan
Virginia	Yes		Also have update with project list
Washington	Yes		Also have video about ITS
West Virginia	Yes		
Wisconsin	No		Refer to ITS in their DOT strategic plan
Wyoming	No		Using some ITS

Note: Most of the "urban plans" were referred to as Early Deployment studies for ITS in urban areas.

Comparison of Selected ITS Strategic Plans

CALIFORNIA

Date Completed:	October 1995 (update in Dec. 1996)
Plan Preparer:	New Technology and Research Program
Plan Time Frame:	15 years (5 years for details)
Vision Statement:	Yes
Mission Statement:	Yes (called a charge)
List of Specific Goals:	Yes
Discussion of National Architecture:	No, but mentioned in plan update
Discussion of State Architecture:	No
Use of Functional Areas or User Services:	No separate plans for functional areas or user services. Services are sorted by elements, many of which match the user services (the update incorporates the market packages of the National ITS Architecture).
Business Plan:	No business plan

COLORADO

Date Completed:	February 1995
Plan Preparer:	Castle Rock Consultants, Centennial Engineering
Plan Time Frame:	Not given
Vision Statement:	No
Mission Statement:	No
List of Specific Goals:	Yes
Discussion of National Architecture:	No
Discussion of State Architecture:	No
Use of Functional Areas or User Services:	No separate plans for functional areas or user services, but uses the user services and the user service bundles.
Business Plan:	This is a combined strategic plan and business plan.

MARYLAND

Date Completed:	October 1996
Plan Preparer:	Maryland DOT
Plan Time Frame:	6 years
Vision Statement:	No
Mission Statement:	Yes
List of Specific Goals:	No
Discussion of National Architecture:	No
Discussion of State Architecture:	No
Use of Functional Areas or User Services:	No separate plans for functional areas or user services. Projects sorted by categories similar to user services.
Business Plan:	Entire two volume document is called a Business Plan. The first volume is a strategic plan including some general funding information. The second volume contains descriptions and costs for specific projects.

MICHIGAN

Date Completed:	1996
Plan Preparer:	Kan Chen, Incorporated
Plan Time Frame:	15 years
Vision Statement:	No, does have entire vision section
Mission Statement:	No
List of Specific Goals:	No
Discussion of National Architecture:	Yes
Discussion of State Architecture:	No
Use of Functional Areas or User Services:	No separate plans for functional areas or user services, but user services and market packages are covered in the appendix.
Business Plan:	No business plan, but does include a long project list.

MINNESOTA

Date Completed:	March 1997
Plan Preparer:	SRF Consulting Group, Castle Rock Consultants, and Cambridge Systematics, Inc.
Plan Time Frame:	Not given
Vision Statement:	Yes
Mission Statement:	No
List of Specific Goals:	Yes
Discussion of National Architecture:	No
Discussion of State Architecture:	Briefly mentioned
Use of Functional Areas or User Services:	No separate plan for functional areas or user services. Potential projects are divided into "Deployment Concepts" which include a mix of functional areas, user services, and other concepts.
Business Plan:	This strategic plan includes a list of several potential projects. A three year work plan will be created to provide project details such as schedule and budget.

NEW JERSEY

Date Completed:	Not given
Plan Preparer:	Parsons Brinckerhoff - FG, Inc.; PB Farradyne, Inc.; TransManagement, Inc.; Dunn Engineering Associates; Roper and Associates; HNTB Corporation; Frederic R. Harris, Inc.; Texas Transportation Institute; and Howard/Stein-Hudson Associates.
Plan Time Frame:	Not given
Vision Statement:	Yes
Mission Statement:	Yes
List of Specific Goals:	No
Discussion of National Architecture:	Yes
Discussion of State Architecture:	Yes
Use of Functional Areas or User Services:	No separate plans for functional areas or user services. Eleven of the user services are recommended for application in New Jersey.
Business Plan:	There is not a separate business plan. Specific locations are recommended for ITS applications and there is a listing of current and future projects.

PENNSYLVANIA

Date Completed:	October 1995
Plan Preparer:	Pennsylvania DOT
Plan Time Frame:	Not given
Vision Statement:	Yes
Mission Statement:	No
List of Specific Goals:	Yes
Discussion of National Architecture:	No
Discussion of State Architecture:	No
Use of Functional Areas or User Services:	No
Business Plan:	No business plan

TENNESSEE

Date Completed:	June 1997
Plan Preparer:	Vanderbilt Engineering Center for Transportation Operations and Research
Plan Time Frame:	Not given
Vision Statement:	No
Mission Statement:	No
List of Specific Goals:	No
Discussion of National Architecture:	No
Discussion of State Architecture:	No
Use of Functional Areas or User Services:	No separate plans for functional areas or user services. Organized by the ITS user services.
Business Plan:	No business plan

Note: Information for Tennessee is taken from a strategic planning progress report which is not a completed strategic plan.

TEXAS

Date Completed:	May 1996
Plan Preparer:	Texas Transportation Institute
Plan Time Frame:	Not given
Vision Statement:	No
Mission Statement:	No
List of Specific Goals:	No
Discussion of National Architecture:	Yes
Discussion of State Architecture:	No
Use of Functional Areas or User Services:	No separate plans for functional areas or user services. Organized by 12 "emphasis areas" which include several of the user services.
Business Plan:	No business plan

VIRGINIA

Date Completed:	March 1993
Plan Preparer:	Virginia DOT
Plan Time Frame:	20 years
Vision Statement:	No
Mission Statement:	Yes
List of Specific Goals:	No
Discussion of National Architecture:	Yes
Discussion of State Architecture:	No
Use of Functional Areas or User Services:	No separate plans for functional areas or user services. Organized using the first five functional areas.
Business Plan:	A ten year business plan was completed in 1997.

WASHINGTON

Date Completed:	November 1993
Plan Preparer:	JHK & Associates
Plan Time Frame:	20 years
Vision Statement:	No
Mission Statement:	No
List of Specific Goals:	Yes
Discussion of National Architecture:	No
Discussion of State Architecture:	Yes
Use of Functional Areas or User Services:	No separate plans for functional areas or user services. Organized by five categories which are similar to the user services.
Business Plan:	No separate business plan, but does include a detailed project list and an action plan with some funding information.

WEST VIRGINIA

Date Completed:	December 1996
Plan Preparer:	West Virginia DOT
Plan Time Frame:	Not given
Vision Statement:	Yes
Mission Statement:	No
List of Specific Goals:	No
Discussion of National Architecture:	No
Discussion of State Architecture:	No
Use of Functional Areas or User Services:	No separate plans for functional areas or user services. Divided into the six functional areas.
Business Plan:	No business plan

Summary of ITS Strategic Plans

State	Date Completed	Plan Preparer	Time Frame	Vision Statement	Mission Statement	List of Goals	National Architecture	State Architecture	Functional Areas / User Services	Business Plan
California	Oct. 1995	New Technology and Research Program	15 years	Yes	Yes	Yes	No	No	No	No
Colorado	Feb. 1995	Castle Rock Consultants, Centennial Engineering	**	No	No	Yes	No	No	User Services	Included
Maryland	Oct. 1996	Maryland DOT	6 years	No	Yes	No	No	No	No	Separate
Michigan	1996	Kan Chen, Inc.	15 years	No	No	No	Yes	No	No	No
Minnesota	Mar. 1997	SRF, Castle Rock, Cambridge Systematics	**	Yes	No	Yes	No	No	No	No
New Jersey	**	Parsons Brinckerhoff, Farradyne, HNTB, TTI, ...	**	Yes	Yes	No	Yes	Yes	No	No
Pennsylvania	Oct. 1995	Pennsylvania DOT	**	Yes	No	Yes	No	No	No	No
Tennessee	June 1997	Vanderbilt Engineering Center	**	No	No	No	No	No	User Services	No
Texas	May 1996	Texas Transportation Institute	**	No	No	No	Yes	No	No	No
Virginia	Mar. 1993	Virginia DOT	20 years	No	Yes	No	Yes	No	Functional Areas	Separate
Washington	Nov. 1993	JHK & Associates	20 years	No	No	Yes	No	Yes	No	Included
West Virginia	Dec. 1996	West Virginia DOT	**	Yes	No	No	No	No	Functional Areas	No

** Information not given in report.

Note: Information for Tennessee is taken from a planning progress report, not a completed strategic plan.

10.2 APPENDIX B

SUMMARY OF FOCUS GROUP MEETINGS FOR OCT-DEC 1998 (ARTS AND ATIS)

This appendix includes a summary of the data collected and the methods used for collection in the development of Phase 1 of the Strategic Plan. Data for Advanced Rural Transportation Systems (ARTS) and Advanced Traveler Information Systems (ATIS) was collected at two different meetings, a focus group meeting held on October 10, 1997 and an Area Development District (ADD) meeting held December 3, 1997. Data and collection methods for Advanced Traffic Management Systems (ATMS), Advanced Public Transportation Systems (APTS), and Advanced Vehicle Safety Systems (AVSS) are included in Appendix C.

10.2.1 Advanced Rural Transportation Systems

Following is a list of information contained within this section of Appendix B.

Surface Transportation Issues Form - This form was used at the focus group meeting on October 10, 1997, to identify issues relating to surface transportation.

Focus Group Issues - This is a summary of results from the focus group meeting. It is a list of all issues, top three issues, and longer term issues with the number of people "voting for" each issue in parentheses.

Prioritization of User Service Areas - This shows how the focus group ranked the importance of the User Services. The number of votes for a "high," "medium" or "low" ranking is given with a total score for each User Service. The votes were scored as: "high" - 3 points, "medium" - 2 points, and "low" - 1 point.

Visioning Process Form - This form was used at the focus group meeting for participants to describe their vision for specific areas of ITS.

Vision Focus Areas - This is a summary of the vision elements on the "Vision Process Form."

Issues List Form - This form was used at the ADD meeting on December 3, 1997, to provide additional input concerning which issues should be considered top three or longer term.

ADD Issues - This is a summary of results from the ADD meeting. The top three and longer term issues are listed, with the number of people "voting for" each issue in parentheses.

Vision and Goals Comment Sheet - This comment sheet was given to the participants of the focus group and ADD meetings. They were asked to comment on the vision and rank the goals.

Vision and Goals Comments - This is a summary of responses from the "Vision and Goals Comment Sheet" with a ranking of the goals.

Surface Transportation Issues
Relating to Rural Kentucky

Issue Identification:

(Please identify at least five issues that you believe constrain or limit [or constitute significant opportunities for improving] rural transportation quality, capacity and service to Kentuckians and tourists.)

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

Most Important Issues Selection:

(After all issues have been identified, please select the major or most important issues that you believe deserve attention. First list your top three that deserve more immediate attention. Then list at least one issue that you believe deserves longer-term attention.)

TOP THREE ISSUES
(For immediate attention)

1. _____

2. _____

3. _____

LONGER-TERM ISSUE(S)

1. _____

2. _____

Note: It is important that you turn in this sheet at the end of your group session. If you wish to remain anonymous, it's ok with us. Otherwise, please provide your name and telephone and e-mail below. Thank you for participating.

Focus Group Issues

Remoteness/accessibility
Cost effectiveness (b/c ratio)
Multiple government jurisdictions
Intermodal coordination
Inadequate/substandard facilities
Poor communication among service providers
Political constraints
Real-time accident information
National publicity for transportation
Rural (I-75) corridor reliability
Universal naming of streets and roads
Lack of street names on maps
Traffic management in construction
Lack of technical assistance for agencies
Substandard road design and conditions
Truck capacity/safety (capacity of highway system)
Few alternate routes
Highway reconstruction
Extreme terrain conditions
Lack of connectivity
Lack of spokesperson
Signing
Delay information
Detour information
Traveler information
Few mode choices
Attitudes of rural drivers
Travel distances
Funding
Incident management
Weather and visibility

Issues voted as top three by participants:

1. Remoteness/connectivity/accessibility (5)
2. Funding/budget constraints (4)
3. Lack of information and technical assistance (3)
4. Construction/incident traffic management (3)
5. Substandard roadway design/geometry (3)
6. Standard/uniform names (2)
7. Lack of communication (2)
8. Crash detection/location (1)
9. Jurisdictional conflicts (1)
10. Signing and traveler information (1)
11. Improve safety and efficiency along I-75 (1)
12. Truck capacity/safety improvements (1)
13. Cost effectiveness (1)
14. Need more rural freeway construction (1)

Longer term issues:

1. Jurisdictional/political issues (6)
2. Budget constraints (3)
3. National intermodal coordination (3)
4. National visibility for transportation (3)
5. Cost effectiveness (b/c ratio) (2)
6. Road design (1)
7. Statewide coordination (1)

Prioritization of User Service Areas

	High	Med	Low	Score	Rank
Travel and Transportation Management					
En-route driver information	6	3	0	24	2
Travel services information	2	3	4	16	10
Route guidance	3	5	1	20	6
Traffic control	3	5	1	20	6
Incident management	7	1	1	24	2
Emissions testing	0	1	8	10	12
Travel Demand Management					
Demand management	3	1	5	16	10
Pre-trip travel information	3	6	0	21	5
Ride matching and reservation	1	6	2	17	9
Public Transportation Operations					
Public transportation management	6	2	1	23	3
En route transit information	2	5	2	18	8
Personalized public transit	6	2	1	23	3
Public travel security	3	1	5	16	10
Electronic Payment					
Electronic payment services	3	2	4	17	9
Commercial Vehicle Operations					
Electronic screening	5	3	1	22	4
Automated safety inspections	3	3	3	18	8
On-board safety monitoring	5	3	1	22	4
Administrative processes	4	3	2	20	6
HAZMAT incident response	8	1	0	26	1
Freight mobility	6	3	0	24	2
Emergency Management					
Emergency notification and personal security	8	1	0	26	1
Emergency vehicle management	8	1	0	26	1
Advanced Vehicle Control And Safety Systems					
Longitudinal collision avoidance	4	3	2	20	6
Lateral collision avoidance	4	3	2	20	6
Intersection collision avoidance	5	3	1	22	4
Vision enhancement for crash avoidance	4	3	2	20	6
Safety readiness	4	3	2	20	6
Pre-crash restraint deployment	3	4	2	19	7
Automated highway systems	0	2	7	11	11

Visioning Process Form
Relating to Rural Transportation

Selected Vision Focus Areas:
Which of the following areas are important to you in the Commonwealth of Kentucky's vision for Rural Transportation as part of ITS? (Check one or more below)

____ A. Travel and Transportation Management
____ B. Travel Demand Management
____ C. Public Transportation Operations
____ D. Electronic Payment
____ E. Commercial Vehicle Operations
____ F. Emergency Management
____ G. Advanced Vehicle Control and Safety Systems

Key Vision Components for Selected Area(s):
Please tell us about your vision for the areas selected in the space below. You may combine categories if you like. Use back of sheet if necessary.

A B C D E F G (circle the one(s) you're writing about)

A B C D E F G

A B C D E F G

Note: Please give us your name, telephone, and e-mail address:

Vision Focus Areas

B. Travel Demand Management

A system to provide information pertaining to roadway conditions, route and mode of travel. Transit information such as timetables and connecting points of urban areas would also be included.

C. Public Transportation Operations

A seamless (coordinated) statewide public transit should be established with funding available to allow "affordable" service to all rural residents. A personalized system that includes automated reservations and dispatching will ensure efficient use of resources. This will require better communication and consolidation of transportation providers. Increased use of information technology will also be necessary.

D. Electronic Payment

Payments will be made by electronic swipe cards and transponders which can identify the user.

E. Commercial Vehicle Operations

The time required for registration, toll collection, and inspection of commercial vehicles will be reduced. Using incentives to reward safe carriers will help reduce the number of unsafe commercial vehicles on the highways. Increased use of alternative modes of transportation will reduce the number of commercial vehicles on rural roads and highways.

F. Emergency Management

Develop a system for rural areas to avoid incidents (by improving signing and alleviating roadway problems such as substandard design) and to provide quicker notification of emergency agencies and travelers when incidents occur. Information about alternate routes and times roads are closed would be made available.

Emergency management will be coordinated between jurisdictional areas. Communication and vehicle location technologies will improve routing and reduce response times. Vehicles will be equipped with mayday systems for immediate notification of incidents.

G. Advanced Vehicle Control and Safety Systems

In ten years, vehicles will have road weather warning devices and be able to sense the presence of all surrounding vehicles. The warning from these systems will allow driver response or automated vehicle computerized response to avoid accidents.

A&B. Travel and Transportation Management & Travel Demand Management

An advanced corridor will be established that uses current technologies such as HAR, overhead message signs, CVO, traveler information systems, and alternate corridor - signing/signalization/bypasses to reduce congestion, handle accidents/construction delays, and reduce truck/auto conflicts. This advanced corridor would be the state-of-the-art for interstates. This "pilot" corridor would most likely be I-75 because of its total vehicle-miles traveled, economic importance, nationwide visibility, and opportunity to interface with existing/ongoing ITS projects. This pilot project would make Kentucky an ITS leader and could help mobilize interest in transportation. This increased interest in transportation would contribute to increased funding for all other ITS projects and to transportation in general.

A&E. Travel and Transportation Management & Commercial Vehicle Operations

This includes incident management, jurisdictional coordination, and route guidance for cars and trucks.

C&G. Public Transportation Operations & Advanced Vehicle Control and Safety Systems

Coordinated dispatching for regions will be dictated by connection rather than political boundaries.

ISSUES LIST

Advanced Rural Transportation Systems (ARTS)

Issues that may limit or provide opportunity for improving the quality of rural transportation in Kentucky: (Please list any issues that you feel have been left out.)

Remoteness/accessibility
Cost effectiveness (b/c ratio)
Multiple government jurisdictions
Intermodal coordination
Inadequate/substandard facilities
Poor communication among service providers
Political constraints
Real-time accident information
National publicity for transportation
Rural (I-75) corridor reliability
Universal naming of streets and roads
Lack of street names on maps
Traffic management in construction
Lack of technical assistance for agencies
Substandard road design and conditions
Truck capacity/safety (capacity of highway system)
Few alternate routes
Highway reconstruction
Extreme terrain conditions
Lack of connectivity
Lack of spokesperson
Signing
Delay information
Detour information
Traveler information
Few mode choices
Attitudes of rural drivers
Travel distances
Funding
Incident management
Weather and visibility

Top Three Issues

Please select the three most important issues that you believe deserve immediate attention and list them in order of importance.

1. _____

2. _____

3. _____

Long Term Issues

Please list two issues that you believe deserve longer-term attention.

1. _____

2. _____

ADD Issues

Issues voted as Top Three by Participants:

1. Substandard road design and conditions (5)
2. Funding (5)
3. Universal naming of streets and roads (4)
4. Inadequate/substandard facilities (3)
5. Attitudes of rural drivers (3)
6. Weather and visibility (3)
7. Poor communication among service providers (3)
8. Remoteness/accessibility (2)
9. Real-time accident information (2)
10. Delay information (2)
11. Political constraints (2)
12. Lack of street names on maps (2)
13. Capacity/safety of highway system (2)
14. Incident management (2)
15. National publicity for transportation (1)
16. Traffic management in construction (1)
17. Highway reconstruction (1)
18. Extreme terrain conditions (1)
19. Signing (1)
20. Cost effectiveness (b/c ratio) (1)
21. Lack of connectivity (1)

Long Term Issues:

1. Intermodal coordination (4)
2. Inadequate/substandard facilities (3)
3. Highway reconstruction (3)
4. Lack of connectivity (3)
5. Funding (3)
6. Cost effectiveness (b/c ratio) (2)
7. Real-time accident information (2)
8. Substandard road design and conditions (2)
9. Traveler information (2)
10. Multiple government jurisdictions (1)
11. Political constraints (1)
12. Lack of street names on maps (1)
13. Traffic management in construction (1)
14. Extreme terrain conditions (1)
15. Signing (1)
16. Few mode choices (1)
17. Weather and visibility (1)

COMMENT SHEET

Advanced Rural Transportation Systems (ARTS)

Do you feel that this vision accurately reflects your views of what rural transportation in Kentucky should be like in approximately 20 years?

___ Yes ___ No

If possible, please explain your answer.

_____
_____
_____
_____
_____

We have developed the following goals relating to ITS in rural transportation. Please write in any goals that you feel should be added to this list then rank them in order of importance.

Rank

____ 1. To enhance statewide emergency response capability.
____ 2. To improve connectivity between rural transportation systems.
____ 3. To promote communication and information sharing between agencies.
____ 4. To implement efficient traffic management practices for incidents and construction activities.
____ 5. To improve signing and traveler information resources.
____ 6. To develop Advanced Vehicle Safety Systems.
____ 7. _____
____ 8. _____

Additional comments:

_____
_____
_____
_____

NOTE: It is important that you turn in this sheet at the end of the session. If you wish to remain anonymous it's ok with us. Otherwise, please provide your name, telephone and e-mail below. Thank you for participating.

_____

Vision and Goals Comments

Does the vision reflect your views?

Yes - 19
No - 1

There were no comments or suggestions included with the "No" response.

The goals were ranked from 1 to 6. The rankings were assigned a score (1 = 6 points, ..., 6 = 1 point). The results are given below.

Goal	Score
To enhance statewide emergency response capability.	92
To improve connectivity between rural transportation systems.	71
To implement efficient traffic management practices for incidents and construction activity.	67
To promote communication and information sharing between agencies.	65
To improve signing and traveler information resources.	54
To develop Advanced Vehicle Safety Systems.	49

Other goals listed were:

1. To improve substandard road construction.
2. To implement "smart" cards for toll roads.
3. To develop advanced warning for animal (deer) xings.
4. To take drivers licenses away from people over 75 or retest them.

10.2.2 Advanced Traveler Information Systems

Following is a list of information contained within this section of Appendix B.

Surface Transportation Issues Form - This form was used at the focus group meeting on October 10, 1997 to identify issues relating to surface transportation.

Focus Group Issues - This is a summary of results from the Surface Transportation Issue Form. First is a list of issues that may constrain or present opportunities for advancement in transportation. Participants then identified their top three and longer term issues. (The number in parenthesis represents the number of people that listed that particular issue.)

Prioritization of User Service Areas - This shows how the focus group ranked the importance of the User Services to traveler information. The votes were scored as: "high" - 3 points, "medium" - 2 points, and "low" - 1 point. Based on this, the highest possible score for any user service area would be 21.

Visioning Process Form - This form was used at the focus group meeting for participants to describe their vision for specific areas of ITS.

Vision Focus Areas - This is a summary of the vision elements provided by participants on the "Vision Process Form." The number in parentheses refers to the number of people with comments on that particular area.

Issues List Form - This form was used at the ADD meeting on December 3, 1997, to provide additional input concerning which issues should be considered top three or longer term.

ADD Issues - This is a summary of results from the ADD meeting. The top three and longer term issues are listed with the number of people including each issue in parentheses.

Vision and Goals Comment Sheet - This comment sheet was given to the participants of the focus group and ADD meetings. They were asked to comment on the vision and rank the goals.

Vision and Goals Comments - This is a summary of responses from the "Vision and Goals Comment Sheet" with a ranking of the goals. The goals were scored as: First - 7 points, Second - 6 points, Third - 5 points, Fourth - 4 points, Fifth - 3 points, Sixth - 2 points, and Seventh - 1 point. (Not all participants ranked every goal.) The final ranking in the far right-hand column is based on the overall score for each goal.

Surface Transportation Issues
Relating to Traveler Information

Issue Identification:

(Please identify at least five issues that you believe constrain or limit [or constitute significant opportunities for improving] transportation quality, capacity and service to Kentuckians and travelers in the Commonwealth.)

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

Most Important Issues Selection:

(After all issues have been identified, please select the major or most important issues that you believe deserve attention. First list your top three that deserve more immediate attention. Then list at least one issue that you believe deserves longer-term attention.)

TOP THREE ISSUES
(For immediate attention)

1. _____

2. _____

3. _____

LONGER-TERM ISSUE(S)

_____

_____

Note: It is important that you turn in this sheet at the end of your group session. If you wish to remain anonymous, it's ok with us. Otherwise, please provide your name and telephone and e-mail below. Thank you for participating.

Focus Group Issues

Issues List

Advanced Warning of Roadway Events/Conditions
Programable Signage/HAR
Construction Management
Resource Availability
Unavailability of efficient transit
Congestion Management
Air Fare
Incident Detection/Management
Linking TMC's
Public/Private Partnerships
Internet
Budgets - Prioritizing
Education
Apathy for Change
Availability of Services
Agency Turfism
Lack of Forethought
Too Few Persons per Vehicle
Public Ttransit/Attractiveness
Reduction in Vehicle-Miles Traveled
Remote Areas
Lower than Average Vehicle Turnover

Issues voted as top three by participants

1. Construction Management (4)
2. Incident Detection/Management (3)
3. Linking Urban Areas (3)
4. Congestion Management (2)
5. Legal Review/Changes (2)
6. Education of Public (2)
7. Budgets/Prioritizing (2)
8. Increase Public Transit Attractiveness (1)
9. Resource Availability (1)
10. Programmable Signs (1)
11. Reduce VMT (1)
12. Turfism (1)

Longer-Term Issues

1. Budgets/Prioritizing (5)
2. Public Transit Availability/Attractiveness (3)
3. Education (3)
4. Public/Private Partnerships (2)
5. Construction Management (1)

Prioritization by User Service Area

	HIGH	MEDIUM	LOW	SCORE
Travel and Transportation Management				
En-route Driver Information	6	1	0	20
Travel Services Information	2	4	1	15
Route Guidance	1	4	2	13
Traffic Control	6	1	0	20
Incident Management	7	0	0	21
Emissions Testing	2	1	4	12
Travel Demand Management				
Demand Management	4	2	1	17
Pre-trip Travel Information	3	3	1	16
Ride Matching and Reservation	1	4	2	13
Public Transportation Operations				
Public Transportation Management	1	6	0	15
En-route Transit Information	4	3	0	18
Personalized Public Transit	1	4	2	13
Public Travel Security	0	5	2	12
Electronic Payment				
Electronic Payment Services	1	2	4	11
Commercial Vehicle Operations				
Electronic Screening	3	2	2	15
Automated Safety Inspections	2	2	3	13
On-board Safety Monitoring	3	4	0	17
Administrative Processes	1	2	4	11
HAZMAT Incident Response	6	1	0	20
Freight Mobility	1	2	4	11
Emergency Management				
Emergency Notification and Personal Security	6	1	0	20
Emergency Vehicle Management	5	2	0	19
Advanced Vehicle Control and Safety Systems				
Longitudinal Collision Avoidance	1	4	2	13
Lateral Collision Avoidance	1	4	2	13
Intersection Collision Avoidance	1	5	1	14
Vision Enhancement for Crash Avoidance	2	4	1	15
Safety Readiness	2	4	1	15
Pre-crash Restraint Deployment	1	2	4	11
Automated Highway Systems	0	1	6	8

Visioning Process Form

Relating to Advanced Traveler Information Systems Development

Selected Vision Focus Areas:

Which of the following areas are important to you in the Commonwealth of Kentucky's vision for Advanced Traveler Information Systems as part of ITS? (Check one or more below)

____ A. Travel and Transportation Management
____ B. Travel Demand Management
____ C. Public Transportation Operations
____ D. Electronic Payment
____ E. Commercial Vehicle Operations
____ F. Emergency Management
____ G. Advanced Vehicle Control and Safety Systems

Key Vision Components for Selected Area(s):

Please tell us about your vision for the areas selected in the space below. You may combine categories if you like. Use back of sheet if necessary.

A B C D E F G (circle the one(s) you're writing about)

A B C D E F G

A B C D E F G

Note: Please give use your name, telephone, and e-mail address:

Vision Focus Areas

A. Travel and Transportation Management (7)

Integration (on a regional or state wide basis) of HAR, cell phones, variable message signs, etc.
Link TRIMARC, ARTIMIS, and Lexington (including I-75, I-71, I-65, and some of I-64)
Traveler information: weather, construction, accidents, congestion (3)
Incident Detection
Re-routing of traffic (pre-determined routes, timing plans, signage) (2)
Information on services available (hotels, fuel, food, etc.)
Variable message signs (2)

B. Travel Demand Management (4)

Reduce the vehicle-miles traveled
Reduce the number of single occupancy vehicles
Make public transit more attractive
Updated information at entry points to Kentucky
Traveler information: construction, weather, etc.
Information for use in timing and routing (2)
Information from television, computers, etc. (2)
Public transit information
Infrequent users should be able to use (transit) without a hassle
Real-time and accurate information

C. Public Transportation Operations (3)

Personalized information for travelers
Accurate times should be available (arrival, departure, destination)
Make public transit attractive to driving public
Support new and different transit modes
Make changes to impediments for transit access (gas tax, etc.)
Develop in major urban areas, and between these areas

D. Electronic Payment (1)

Use pricing techniques to control travel (parking and highway)

E. Commercial Vehicle Operations (1)

All weigh stations in Kentucky with electronic clearance
Fifty percent of all trucks have transponders

F. Emergency Management (2)

Data systems to allow resource allocation
Enhanced reference markers (beyond interstate)
Cellular phones - mandatory on new cars
Emergency button - Mayday
A maximum distance between EMS stations, established by law
Response time - established state wide

G. Advanced Vehicle Control and Safety Systems

H. Total Overhaul of Laws and Regulations

Laws should protect the individual motorist

Issues List
Advanced Traveler Information Systems (ATIS)

Issues that may limit (or constitute significant opportunities for improving) transportation quality in Kentucky:

- Advanced Warning of Roadway Events/Conditions
- Programable Signs/HAR
- Construction Management
- Resource (Emergency response) Availability
- Unavailability of Efficient Transit
- Congestion Management
- Air Fare
- Incident Detection/Management
- Linking Traffic Management Centers
- Public/Private Partnerships
- Internet
- Budgets - Prioritizing
- Education
- Apathy for Change
- Availability of Services
- Agency Turfism
- Lack of Forethought
- Too Few Persons per Vehicle
- Public Transit/Attractiveness
- Reduction in Vehicle-Miles Traveled
- Remote Areas
- Lower than Average Vehicle Turnover

Most Important Issues Selection
Please select the three most important issues that you believe deserve immediate attention and list them (in order of importance) under "Top Three Issues". Then list two issues you believe deserve longer-term attention. (You may identify issues not listed above.)

Top Three Issues

1._____

2._____

3._____

Longer-Term Issues

1._____

2._____

NOTE: It is important that you turn in this sheet at the end of this session. If you wish to remain anonymous it's ok with us. Otherwise, please provide your name, telephone and e-mail below. Thank you for participating.

_____

ADD Issues

Issues voted as top three by participants
1. Congestion Management (11)
2. Advanced Warning of Roadway Events/Conditions (10)
3. Construction Management (7)
4. Unavailability of Efficient Transit (3)
5. Resource Availability (3)
6. Education (2)
7. Incident Detection/Management (2)
8. Programmable Signs/HAR (2)
9. Public Transit/Attractiveness (2)
10. Budgets - Prioritizing
11. Education - Emergency Response - Engineering
12. Remote Areas
13. Availability of Services
14. Apathy for Change
15. Agency Turfism

Longer-Term Issues
1. Education (4)
2. Too Few Persons Per Vehicle (4)
3. Incident Detection/Management (4)
4. Budgets/Prioritizing (3)
5. Remote Areas (3)
6. Linking Traffic Management Centers (2)
7. Resource Availability (2)
8. Public/Private Partnerships (2)
9. Reduce Vehicle-Miles-Traveled (2)
10. Availability of Services (1)
11. Air Fare (1)
12. Public Transit Attractiveness (1)
13. Programable Signs (1)
14. Construction Management (1)
15. Internet (1)
16. GPS Systems in Cars (1)

COMMENT SHEET
Advanced Traveler Information Systems

Do you feel that this vision accurately reflects your views of what traveler information in Kentucky should be like in approximately 20 years?

___ Yes ___ No

Please explain your answer.

_____
_____
_____
_____
_____
_____
_____
_____

We have developed the following goals relating to traveler information. Please write in any goals that you feel should be added to this list then rank them in order of importance.

Rank

____ 1. To reduce traffic congestion resulting from construction projects, roadway hazards, and adverse weather conditions by improving traveler awareness of these situations.
____ 2. To enhance traffic information and management services by integrating them on a regional basis.
____ 3. To improve the response time and increase the availability of emergency services.
____ 4. To increase the attractiveness of public transit through the use of better transit information systems.
____ 5. To increase tourism travel in Kentucky through better dissemination of information.
____ 6. _____
____ 7. _____

Additional comments:

_____
_____
_____
_____
_____
_____
_____

Vision and Goals Comments

Do you agree with vision?

13 YES 03 NO (ADD)
07 YES 00 NO (Focus Group)

The current vision has been revised to reflect the "NO" comments if possible. A summary of those comments follows:

Technology
Technology should be more advanced by 2020.

Deployment Areas
Deployment should not be confined to the metropolitan areas only.

Education
Drivers need better education as to the rules, signs, and laws of the highway and driving.

Goals	1st	2nd	3rd	4th	5th	6th	7th	Score	Rank
To reduce traffic congestion resulting from construction projects, roadway hazards, and adverse weather conditions by improving traveler awareness of these situations	10	8	1	1	1			130	1st
To enhance traffic information and management services by integrating them on a regional basis	5	4	7	3	2	1		114	3rd
To improve the response time and increase the availability of emergency services	4	10	6	2				128	2nd
To increase the attractiveness of public transit through the use of better transit information systems	1		4	7	9			82	4th
To increase tourism travel in Kentucky through better dissemination of information			3	9	9			78	5th
To reduce traffic congestion	1							7	6th
Education of drivers	1							7	6th

10.3 APPENDIX C

SUMMARY OF FOCUS GROUP MEETINGS OF NOVEMBER 1999

10.3.1 ADVANCED TRAFFIC MANAGEMENT SYSTEMS

December 13, 1999

Dear ----------,

Thank you so much for your participation in our Intelligent Transportation Systems (ITS) focus group session on November 3. The information that you and the other stakeholders provided is extremely valuable to us as we work to develop Kentucky's Strategic Plan for ITS.

Attached you will find a summary of the results from our focus group. The first page of the summary shows the "Properties of the Ideal Advanced Traffic Management System" that was developed in the first part of the breakout session. Each block represents a card that was posted on the wall and the top block in each column shows the category name that was assigned.

The second page of the summary shows the "Advanced Traffic Management System: Issues and Opportunities" listed in the second half of the breakout session. These were also grouped into categories and assigned a name. At the end of the session, each person had an opportunity to vote for three categories of most importance. The summary shows the number of votes received by each category.

We have used our knowledge on the subject and the input from the breakout session to develop a draft of a mission statement, a vision, and a set of goals for the Advanced Traffic Management System in Kentucky. This draft document is also attached.

Please review the attached materials for accuracy and completeness and provide us with any comments. A response form is provided to record any comments on the vision and goals. For your convenience, simply fax the form to me at 606-257-1815. Or, if you prefer, mail or e-mail your comments directly to me (mosborne@engr.uky.edu). Please return your responses by Wednesday, December 22. Even if you have no comments, we would still appreciate a response so we know you received the materials.

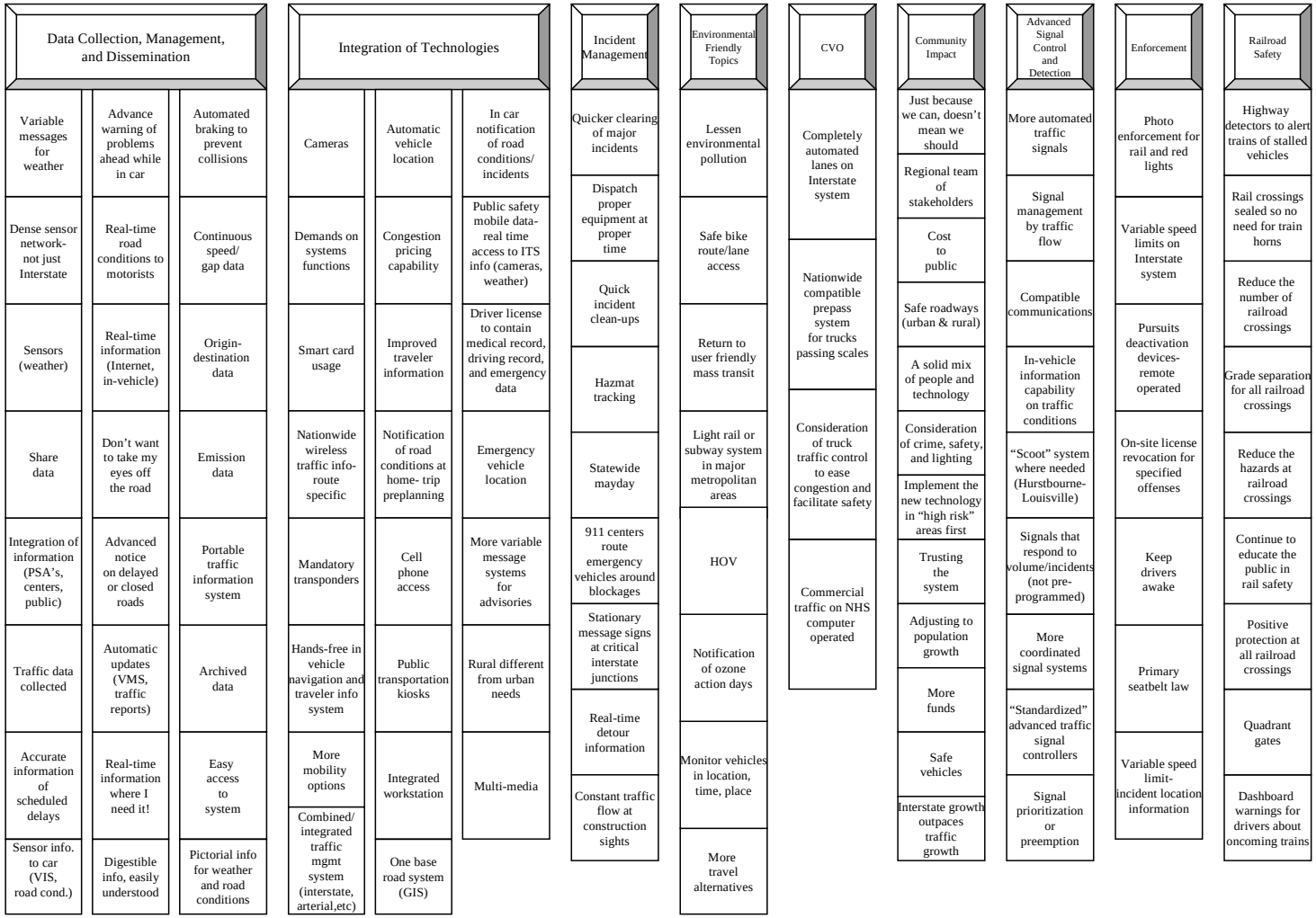
Thank you again for your participation and input. If you have any questions, please contact me.

Sincerely,

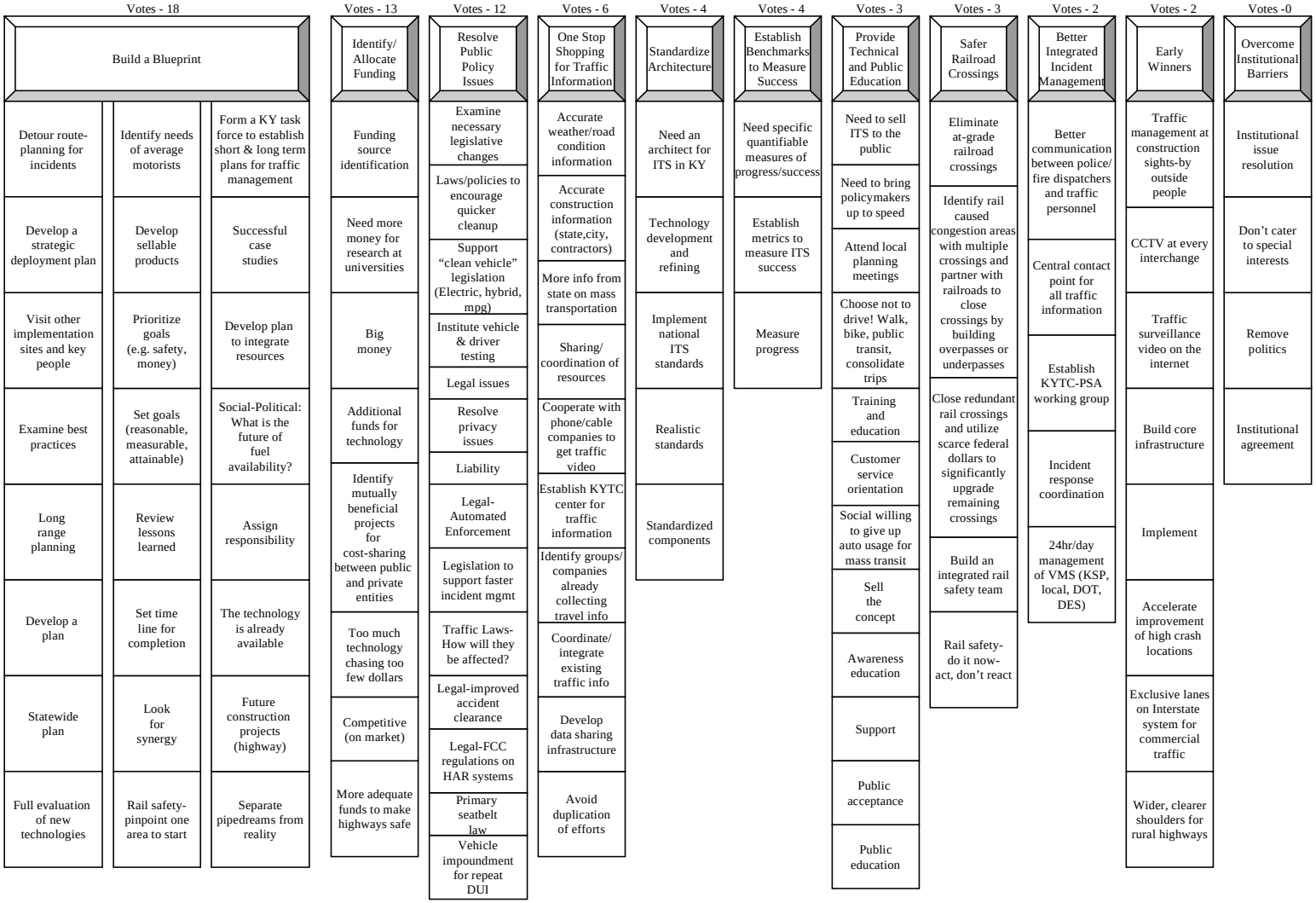
Monica L. Osborne
Kentucky Transportation Center
University of Kentucky
240G Oliver H. Raymond Building
Lexington, KY 40506-0281
606-257-4513 x256

Enclosure

Properties of the Ideal Advanced Traffic Management System in Kentucky



Advanced Traffic Management System: Issues and Opportunities



Response Form
Advanced Traffic Management Systems

1a. Do you feel the vision accurately reflects what traffic management systems in Kentucky should be like in approximately 20 years?

___ Yes ___ No

b. If you answered 'No', please explain.

_____
_____
_____

2a. Do you feel the goals for traffic management accurately address the main issues and opportunities facing our state?

___ Yes ___ No

b. If you answered 'No', please explain.

_____
_____
_____

3a. Do you feel the goals for traffic management are prioritized correctly?

___ Yes ___ No

b. If you answered 'No', please explain.

_____
_____
_____

4. Are there any other goals you would add to this list? If so, what would the goals be?

_____
_____
_____

Please fax or mail this sheet and any additional comments by <u>January 12, 2000</u>.

TO: Monica L. Osborne
University of Kentucky
240G Oliver H. Raymond Bldg.
Lexington, KY 40506-0281
Fax: 606-257-1815

FROM: _____
ORGANIZATION: _____
DATE: _____

10.3.2 ADVANCED PUBLIC TRANSPORTATION SYSTEMS

December 13, 1999

Dear ---------:

Thank you so much for your participation in our Intelligent Transportation Systems (ITS) focus group session back on November 3. The information that you and the other stakeholders provided is extremely valuable to us as we work to develop Kentucky's Strategic Plan for ITS.

Enclosed with this letter, you will find a summary of the results from our focus group. The first page of the summary shows the "Properties of the Ideal Advanced Public Transportation Systems" that we developed in the first part of our breakout session. Each block represents a card that was posted on the wall, as they were during the session, with each column representing a category. The top block in each column shows the category name that was assigned.

The second page of the summary shows the "Issues and Opportunities" that were listed in the second half of the breakout session. As you recall, these were also grouped into categories, and a category name was assigned to each column. In addition, each person had an opportunity to vote for three issues/opportunities that seemed to be most important. The summary shows the number of votes received by each card.

We have used our knowledge of Advanced Public Transportation Systems and the input from the breakout session to develop a draft of a mission statement, a vision, and a set of goals for Kentucky. This draft document is also included.

You are invited to review the enclosed materials for accuracy and completeness and to provide us with any comments you may have. We have provided a response form that you can use to record your comments. For your convenience, you can simply fax the form to us at 606-257-1815. Or, if you prefer, you can mail it or you can e-mail your comments directly to me (jwalton@engr.uky.edu). **Please return your responses by Wednesday, December 22.** Even if you have no comments, we would still appreciate a response so that we know you received the materials.

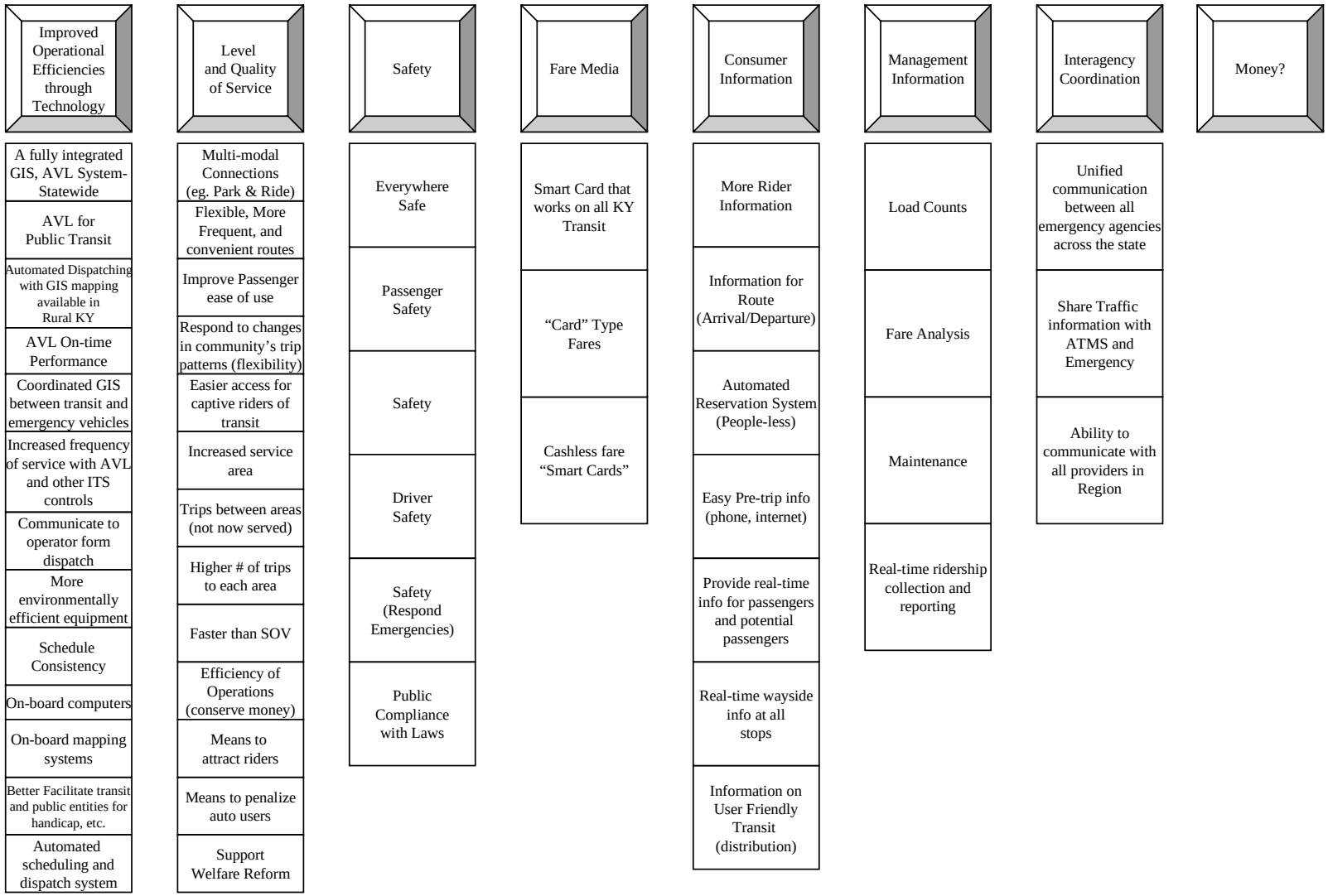
Thank you again for your participation and input. If you have any questions, please don't hesitate to contact me.

Sincerely,

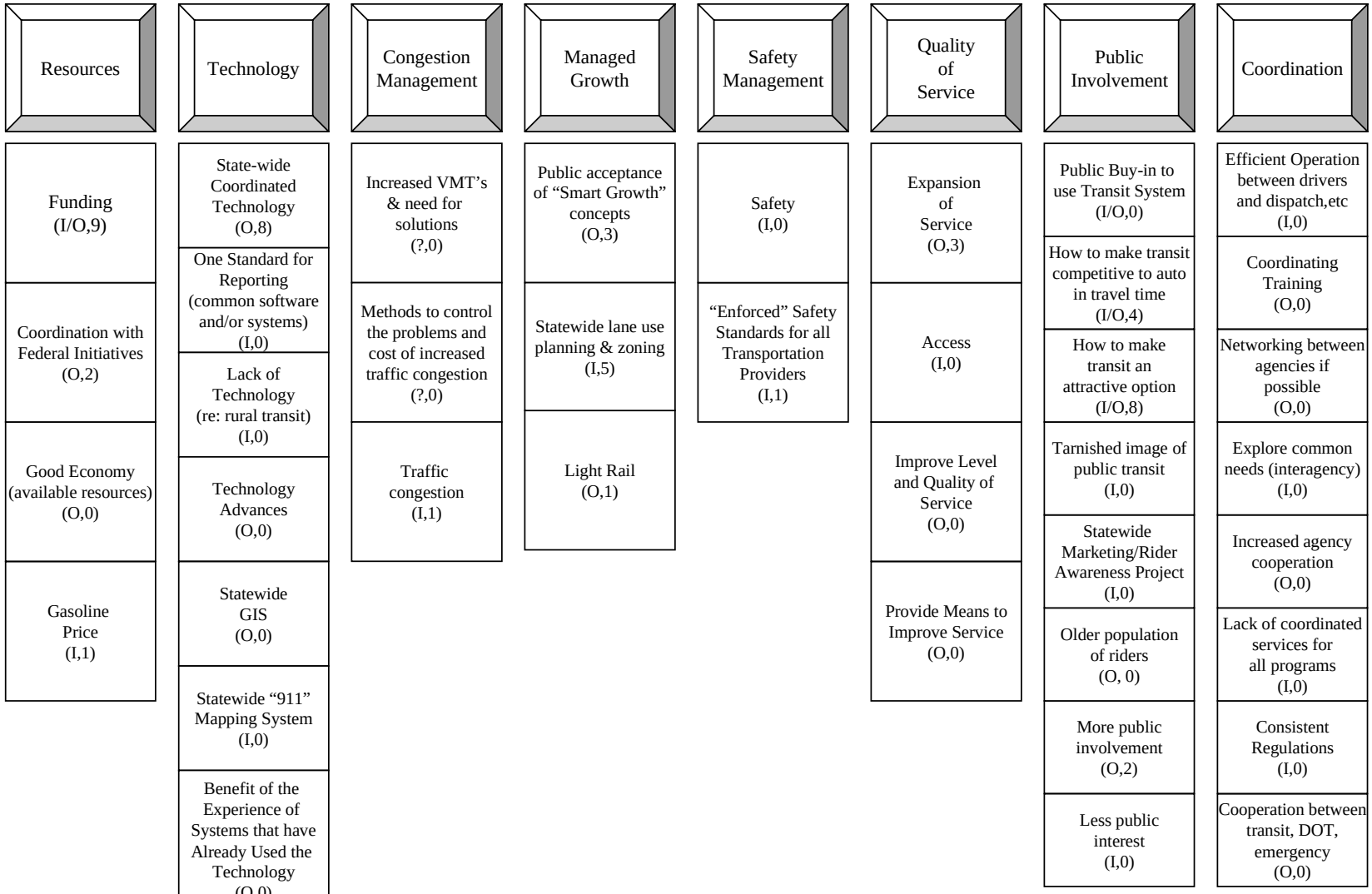
Jennifer Walton
ITS Research Engineer

Enclosure

Properties of the Ideal Advanced Public Transportation System



Issues and Opportunities



RESPONSE FORM
Advanced Public Transportation Systems

1a. Do you feel the vision accurately reflects what public transportation in Kentucky should be like in approximately 20 years?

___ Yes ___ No

b. If you answered 'No', please explain.

_____
_____
_____

2a. Do you feel the goals for public transportation accurately address the main issues and opportunities facing our state?

___ Yes ___ No

b. If you answered 'No', please explain.

_____
_____
_____

3a. Do you feel the goals for public transportation are prioritized correctly?

___ Yes ___ No

b. If you answered 'No', please explain.

_____
_____
_____

4. Are there any other goals you would add to this list? If so, what would the goals be?

_____
_____
_____

Please fax or mail this sheet and any additional comments by December 22, 1999.

TO: Jennifer Walton
176 Oliver H. Raymond Bldg.
Lexington, KY 40506-0281
Fax: 606-257-1815
Email: jwalton@engr.uky.edu

FROM: _____
ORGANIZATION: _____
DATE: _____

10.3.3 ADVANCED VEHICLE SAFETY SYSTEMS

December 14, 1999

Dear ----------:

Thank you so much for your participation in our Intelligent Transportation Systems (ITS) Focus Group session back on November 3. The information that you and the other stakeholders provided is extremely valuable to us as we work to develop Kentucky's Strategic Plan for ITS.

Attached to this letter, you will find a summary of the results from our focus group. The first page of the summary shows the "Properties of the Ideal Advanced Vehicle Safety Systems" that we developed in the first part of our breakout session. Each block represents a card that was posted on the wall, and they are arranged just as they were during the session, with each column representing a category. The top block in each column shows the category name that was assigned.

The second page of the summary shows the "Issues and Opportunities" that were listed in the second half of the breakout session. As you recall, these were also grouped into categories, and a category name was assigned to each column. Also, at the end of the session, each person had an opportunity to vote for three issues/opportunities that seemed to be most important. The summary shows the number of votes received by each card.

We have used the input from the breakout session to develop a draft of a mission statement, a vision, and a set of goals for Advanced Vehicle Safety Systems in Kentucky. This draft document is also attached.

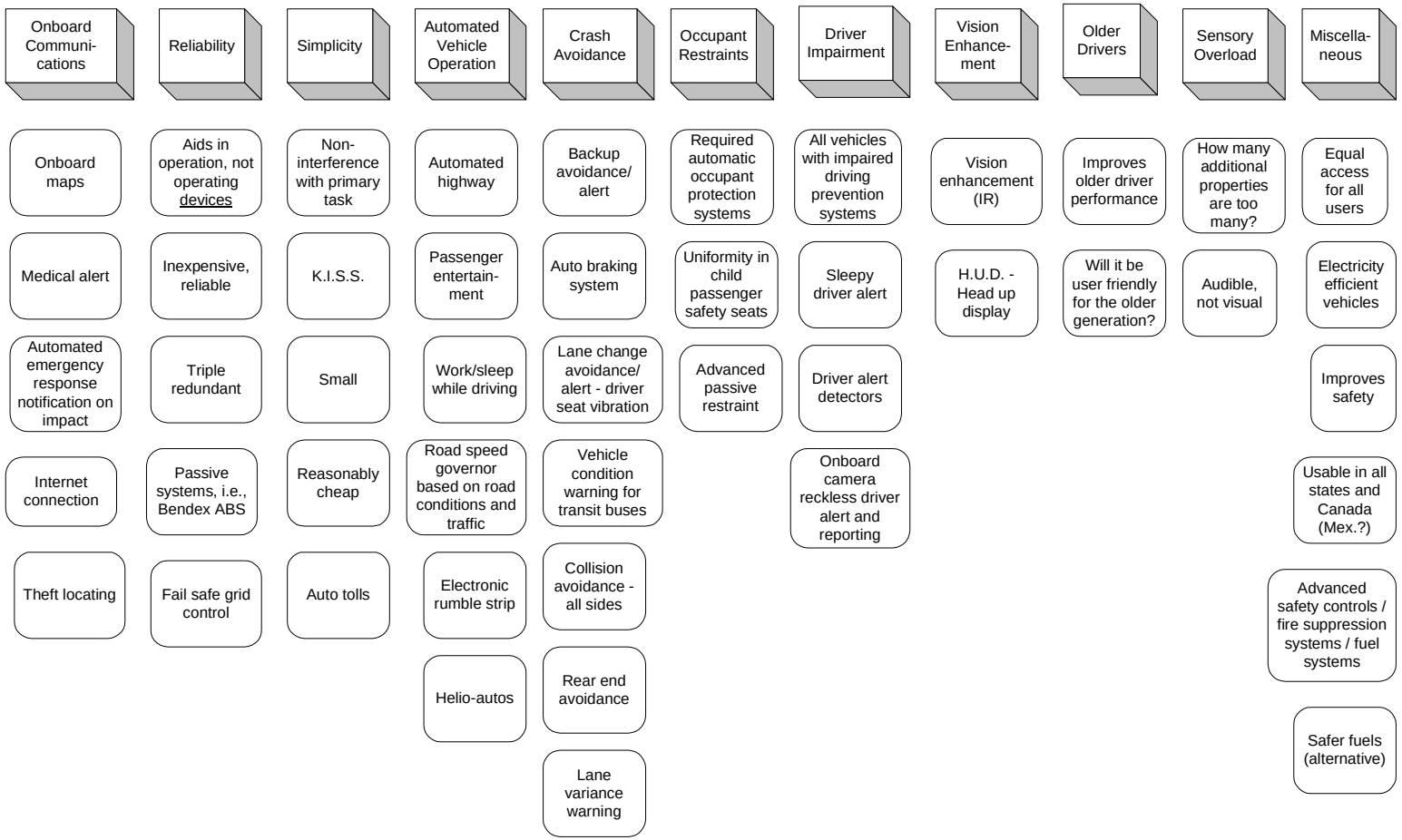
You are invited to review the attached materials for accuracy and completeness and to provide us with any comments you may have. For your convenience, we have provided a response form that you can use to record your comments. You can simply fax the form to us at 606-257-1815. Or, if you prefer, you can mail it in or you can e-mail your comments directly to me (crabtree@engr.uky.edu). If possible, please return your responses by Wednesday, December 22. Even if you have no comments, we would still appreciate a response so we know you received the materials.

Thank you again for your participation and your valuable input. If you have any questions, please don't hesitate to contact me.

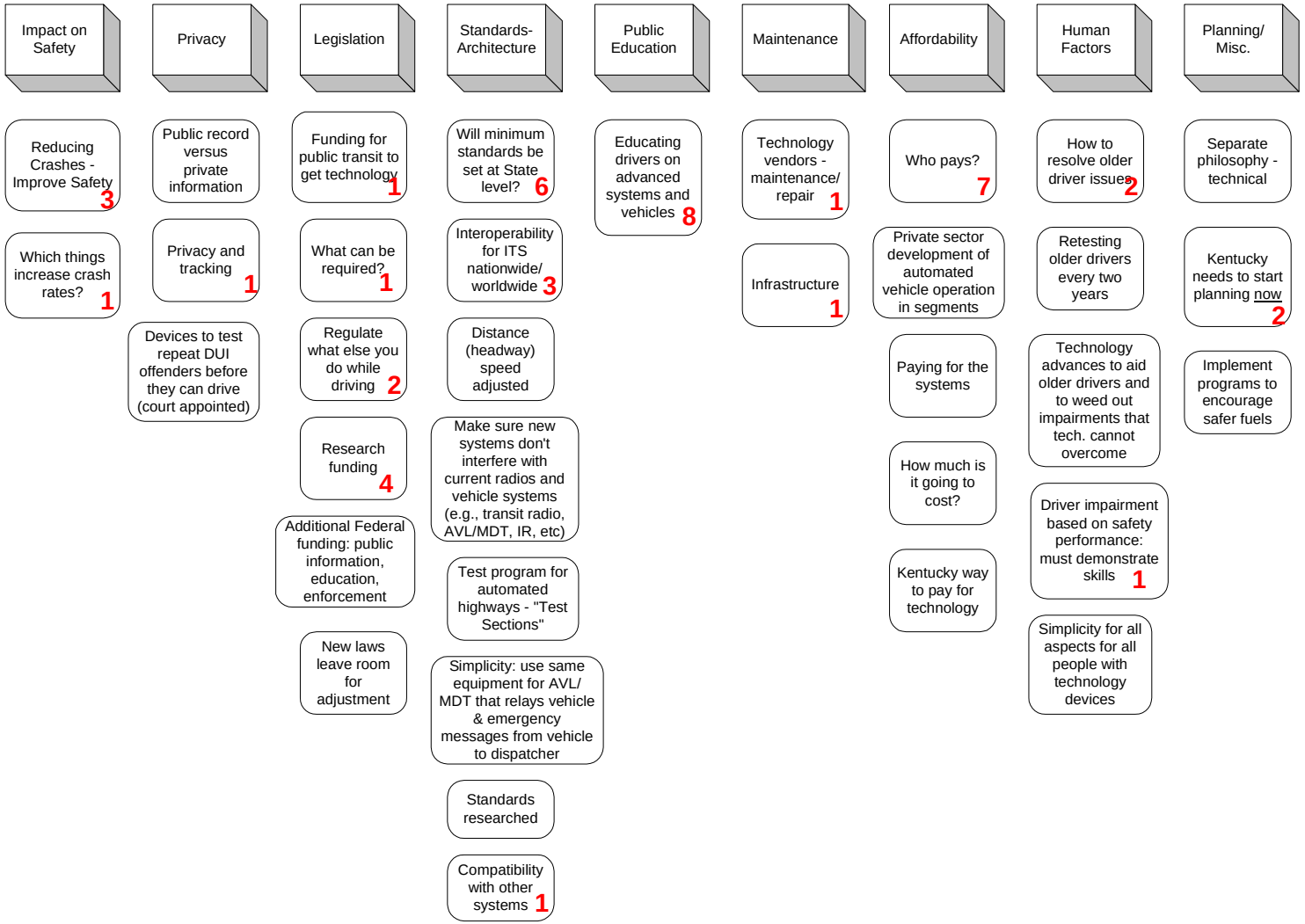
Sincerely,

Joe Crabtree, P.E.
ITS Program Manager

AVSS: Properties



AVSS: Issues and Opportunities



RESPONSE FORM
Advanced Vehicle Safety Systems

1a. Do you feel the vision accurately reflects what Advanced Vehicle Safety Systems should be like in Kentucky in approximately 20 years?

___ Yes ___ No

b. If you answered 'No', please explain.

_____
_____
_____

2a. Do you feel the goals for vehicle safety systems accurately address the main issues and opportunities facing our state?

___ Yes ___ No

b. If you answered 'No', please explain.

_____
_____
_____

3a. Do you feel the goals for vehicle safety systems are prioritized correctly?

___ Yes ___ No

b. If you answered 'No', please explain.

_____
_____
_____

4. Are there any other goals you would add to this list? If so, what would the goals be?

_____
_____
_____

Please fax or mail this sheet and any additional comments by December 22, 1999.

TO: Joe Crabtree
176 Raymond Bldg., Univ. of KY
Lexington, KY 40506-0281
Fax: 606-257-1815
Email: crabtree@engr.uky.edu

FROM: _____
ORGANIZATION: _____
DATE: _____